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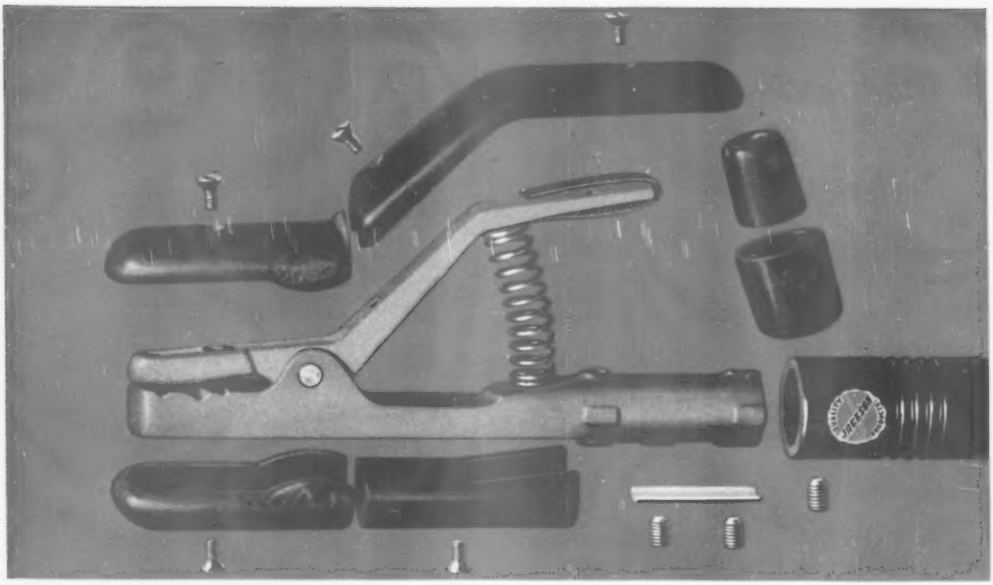
THE WELDING ENGINEER



JACKSON
PRODUCTS
WARREN · MICHIGAN

Arc-Welding Electrode Holders, Ground Clamps and Cable Fittings . . . Helmets, Goggles and Eyeshields . . . Sold World-Wide through Distributors and Dealers

In selecting an electrode holder don't overlook this question: *what does it cost to keep that holder in operation?*

Compare the replacement part prices of Jackson holders types A-1 and A-3 with two competitive makes of similar capacity. All are built on the same general principle; all have copper alloy tongs with insulated jaws.

COST OF ALL PARTS	300-AMP MODEL	500-AMP MODEL
Jackson	$5.47	$6.91
Make "B"	5.64	7.14
Make "C"	5.99	7.54

That's one each of every part that makes up these holders. However, for economical reasons, you'll want to replace some parts more than others. Experience shows that, in all holders of this type, the jaw insulators are replaced most often.

JAW INSULATORS, PAIR	300-AMP MODEL	500-AMP MODEL
Jackson	$ .70	$ .75
Make "B"	.90	1.00
Make "C"	1.20	1.50

There is no question about the durability of Jackson insulators as compared to any on the market, and we'll assume the cost of installation to be the same. This, then, is the conclusion . . .

Jackson Holders save you up to 75c each time a holder of this general type requires new jaw insulators, and, generally, they save you money on all replacement parts.

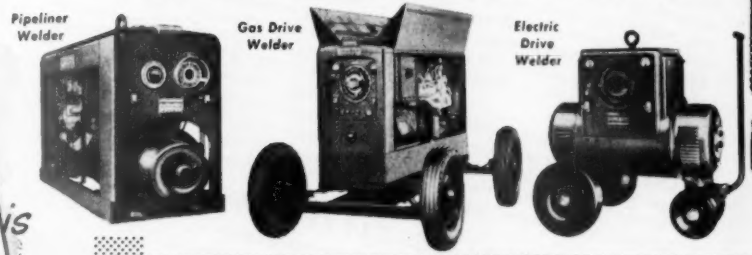
HOBART

"one of the world's largest builders of **arc welders**"

...now produces the best in **electrodes**

The best in welders with the best in electrodes guarantees strong, low cost welds that mean a better product and lower production costs. This profit combination is available to you with Hobart. It's bringing a better product, lower costs and extra profits to hundreds of the leading industrial plants, job shops, pipeline and building contractors.

HOBART BROTHERS COMPANY, BOX U-122, TROY, OHIO



Use this Coupon

Just tell us about your work. We'll recommend the Hobart Welder and Electrodes best suited to your needs.

HOBART BROTHERS CO., BOX U-122, TROY, OHIO

Without obligation, send me full details on items checked below.

☐ Gas Drive Welder ☐ Pipeliner Welder ☐ Electric Drive Welder

Send me ☐ Welder Catalog ☐ Electrode Catalog ☐ Accessories Catalog.

Our work is_____

Name_____ Position_____

Firm_____

Address_____

Free—

☐ . . . Check here for booklet "How to get better Welds"

FLOWLINE Fittings are made by specialists whose entire efforts are devoted to making corrosion-resistant fittings. The unique features of these fittings are the result of our exclusive method of cold-forming and annealing, which puts them in the best condition for corrosion service. With FLOWLINE fittings, users of corrosion piping can obtain the full economies and efficiencies of butt-welded construction.

The tee shown has typical FLOWLINE features. It is stronger than the pipe with which it is used, is scientifically shaped, with round ends accurately machine tool cut and finished for easy fitting to pipe. Its large throat radii and smooth inner contours reduce pressure loss, minimize flow resistance, corrosion, erosion, and product accumulation.

FLOWLINE Welding Fittings—ells, tees, reducers, stub ends, and caps—are made and normally stocked at strategic points in Schedules 10, 40, and 80—(Schedule 5 also available) —sizes ½" through 12"—in stainless types 304, 316, 347; Monel and Nickel. They are annealed, cleaned bright—stainless fittings are passivated—and marked with type of metal, test number, size, schedule, and wall thickness.

WELDING FITTINGS CORP.

NEW CASTLE, PENNSYLVANIA

World's Largest Manufacturer of Stainless Welding Fittings

THE WELDING ENGINEER

A McGRAW-HILL PUBLICATION

VOLUME 37 — NUMBER 12

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DECEMBER, 1952

Cover: *Magnet of the Brookhaven cosmotron (largest atom smasher yet made) is being fabricated by weldors of the Bethlehem Steel Co., Bethlehem, Pa. See pages 48-49.*

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Mid-States INVITES COMPARISON

of its new "BULLDOG" models of

FARM-MAINTENANCE-REPAIR SHOP

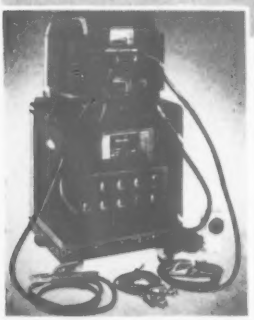
A.C. ARC WELDER and COMBINATION ARC WELDER with BATTERY CHARGER

Re-connectable for 110 Volt or 220 Volt Operation

Compare THESE SPECIFICATIONS:

SECONDARY		
Amperage Range:	220 V. Operation	15-175
	110 V. Operation	15-125
Rated Amp. Load:	220 V. Operation	140
	110 V. Operation	100
Open Circuit Volts		65
Arc Volts		25
Power Factor		75%
Duty Cycle, at Rated Load		50%
Rod Sizes Handled		1/16" to 5/16"
Battery Charging Rate, D.C. Amps.		6
PRIMARY DRAW—		
Amps. at Rated Load:	220 V. Operation	33
	110 V. Operation	50

MODEL 175-A.C. ARC WELDER MODEL 175BC—COMBINATION ARC WELDER and BATTERY CHARGER. Shipped complete with accessories as illustrated. Size: 16" Wide, 13½" Deep, 20" High. Shipping Weight: 136 pounds.



MISSING LINK High Frequency Arc Stabilizer can be used with the new Models No. 175 and No. 175BC BULLDOG A.C. Arc Welders, as illustrated.

FIVE YEAR BURN-OUT PROOF GUARANTEE

Mid-States "BULLDOG" Models No. 175 and No. 175BC have the same superior engineering design, top-quality material and precision workmanship that go into the larger models of the famous MID-STATES line of AC Arc Welders.

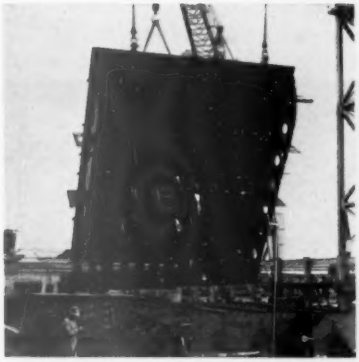
The "BULLDOG" is the answer to the widespread demand by repair shops, maintenance men and the farm trade for an all-purpose, all-around heavy duty portable welder.

When shipped from the factory, the Model No. 175-BC BULLDOG Arc Welder is wired for 220 volt operation and has a 3 prong plug attached to the primary cable. For 110 volt operation, only intermittent use is recommended on properly wired and fused lines.

Write today for Complete Specification Bulletin

Mid-States WELDER MFG. CO.

6025 SOUTH ASHLAND AVENUE CHICAGO 36, ILLINOIS



PLUMBING is welded into prefab bottom sections for fast, new Mariner cargo ships

CYCLONE STRUCTURE for a catalyst recovery collector was finished two weeks ahead of time by efficient weldors. It's made of chrome-moly

NEWS

No Decision Reached on Electrode Pricing

No formal action was taken by OPS in its electrode pricing discussions with the Welding Industry Advisory Committee on Oct. 27. Another meeting is tentatively planned so manufacturers can support their claims for a price increase with detailed information asked by OPS.

Of the 700 different types and sizes of electrodes being manufactured today, half employ rutile in the coating. The price of imported rutile has doubled in the past few months and other important coating materials have also increased in price. Some of these agents are ferro-manganese, ferro-columbium, ferro-molybdenum, ferro-chromium, tungsten and cobalt.

Increased steel prices will naturally cause some increase in electrode prices. Also, wages of the electrode industry closely follow the pattern of the steel industry. The $0.55 increase per 100 lb recently allowed by OPS to cover steel costs and outbound freight has not provided adequate relief, according to some manufacturers. One reported increased costs of $1.00 per 100 lb. Some reported wage increases amounted to 16 cents per 100 lb.

This is the standard OPS uses to grant an increase: if the industry's earnings (based on net worth before taxes) are less than 85% of its earnings during the best three out of four years from 1946 to 1949, it may obtain an increase in ceiling prices sufficient to meet that level. The hitch in this, welding rod manufacturers feel, is that it doesn't take into account the enormous supply of surplus electrodes left over from wartime industries and used through the 1946-1949 period.

* * *

Prefab Ship Bottoms Include Heating Coils

44-TON inner bottom assembly pieces at Bethlehem Pacific's San Francisco shipyard have all piping and heating coils installed at this stage. The big subassembly is fabricated upside down with all floors and girder welded in place. There are 21 different sizes of these assemblies, the above pictured unit measuring 48 by 30 ft.

These bottoms are going into five Mariner-type cargo vessels being built at the Bethlehem yard. They are single screw, high speed vessels. Bottom shells, side shells, wing tanks, transverse bulkheads and decks are all prefabricated.

* * *

DPA Sets Selenium Expansion Goal

A 250,000 lb expansion goal, over and above the 1950 supply of domestic and imported selenium has been announced by DPA. This will bring the total amount available to U. S. industry to 1,100,000 lbs.

Most of our imports come from Sweden, Japan, Africa and Canada. New methods of recovery from copper are being considered to help increase the supply. At present the principal source of selenium is a by-product process in the electrolytic reduction or refining of copper.

Selenium has many uses such as for pigments, rubber and chemicals. Its principal use by the welding industry is the manufacture of rectifiers for changing alternating current to d-c.

* * *

Two Weeks Saved by Welding Catalyst Recovery Collector

WELDORS at the Des Moines Steel Co., Des Moines, Ia., beat the promised delivery date two weeks on a big catalyst recovery collector for an oil refinery regenerator. Built of 4-6% chrome and ½% molybdenum steel, the structure was welded with AWS-E310-15 stainless electrodes, according to information received from General Electric Co. The Des Moines Steel Co. makes heavy industrial products, bridges, platework and other large equipment.

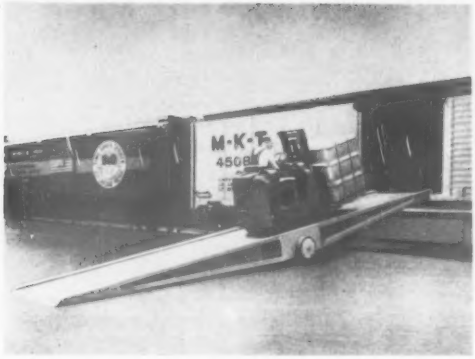
* * *

Kaiser Steel Lands 88,000 Ton Pipe Contract

KAISER Steel Corporation has negotiated a firm contract with Ebasco Services, Inc., as agent for the West Coast Pipeline Co., to supply 88,000 tons of 24-in. and 26-in. steel pipe for the 1,000 mile crude oil line from Wink, Tex., to the Los Angeles area.

Kaiser will start delivery of the order, representing 45% of the total tonnage of pipe required, in the first quarter of 1953. The entire order will be filled by the end of the third quarter.

NEWS . . . . . *from Page 5*



MAGNESIUM loading ramp supplements docking space, cuts demurrage charges. Ramps hold as much as 8 tons

COMFORTABLE seats for weary walkers were offered at the Metal Show booth sponsored by welding distributors

Welded Magnesium Ramp Loads Freight Cars

WHERE no dock facilities are available or where they're overcrowded a new wrought magnesium yard ramp effectively solves a difficult materials-handling problem. These ramps are fabricated by inert-arc welding. They weigh from 1,150 to 1,900 lbs. permitting one man to handle them with the aid of the large wheel on each side. The balanced ramp is easily pushed and rolled to the side of the freight car. A hydraulic lifting mechanism raises one end of the ramp to freight car door level.

These ramps are manufactured in five standard sizes by the Magnesium Company of America, East Chicago, Ind. They are all 30 ft. long but vary in widths of 60 and 70 inches. Capacities range from 6,000 to 16,000 lb., this figure being the combined weight of the load and any equipment, such as the fork-lift pictured above.

* * *

NWSA Eastern Men Hold Biggest Zone Meeting

THE largest attendance at any zone meeting in the history of the National Welding Supply Association was recorded Oct. 24 in Philadelphia when more than 175 eastern welding distributors and manufacturers gathered at the Hotel Warwick. Zone vice-president Carl W. Berner, Welders Supply Co., Philadelphia, performed ably in conducting the business sessions and introducing speakers.

Enthusiasm of eastern welding distributors was also demonstrated in the four days preceding the zone meeting by an attractive booth at the big Metal Show in Philadelphia's Commercial Museum and exhibit halls. Pictured above is the booth, which offered eight comfortable seats to weary Metal Show visitors (See page 46). Mr. Berner and R. S. McCracken, Jr., past president of NWSA, were the prime forces behind securing the booth and offering the distributor story to show visitors.

Robert C. Fernley, secretary-treasurer of NWSA, read an interesting report on NWSA activities, including the results of a survey on remuneration for salesmen. Welding distributors report that 42% of their number pay salary plus a commission. 31% pay straight salaries, 11% pay commission only and 26% have an annual bonus arrangement. Salaries range from a low $200 per month to $1,000 per month. Some 72% of the distributors who answered prefer salesmen with practical welding experience.

Training of over-the-counter salesmen was discussed by Roy H. Silver, Silver Welding Supply, Inc., Roslindale, Mass. His firm expends considerable effort in training these employees, he revealed, including several "dead head" trips on delivery trucks to gain knowledge about customer buying traits.

Slides from the NWSA library on distributor operations around the country were shown next. Discussion on the attractive buildings and office accommodations depicted was lively.

First after-lunch speaker was Russ Schmidt, manager of distributor sales, Air Reduction Sales Co. He suggested percentages of sales volume that should be pro-rated and devoted to direct mail, classified telephone listings, telephone selling, organization, store or showroom, newspaper advertising, tie-in advertising and sales promotion.

A comprehensive report on leasing versus owning of trucks was presented by E. C. Caluwaert, O.K.I. Welding Supply Co., Cincinnati.

Three applications for membership were received from Lee L. Station Welding Supply, Riverdale, N. J.; Ergolyte Mfg. Co., Philadelphia, and Harris Welding Equipment & Service Co., Camden, N. J.

* * *

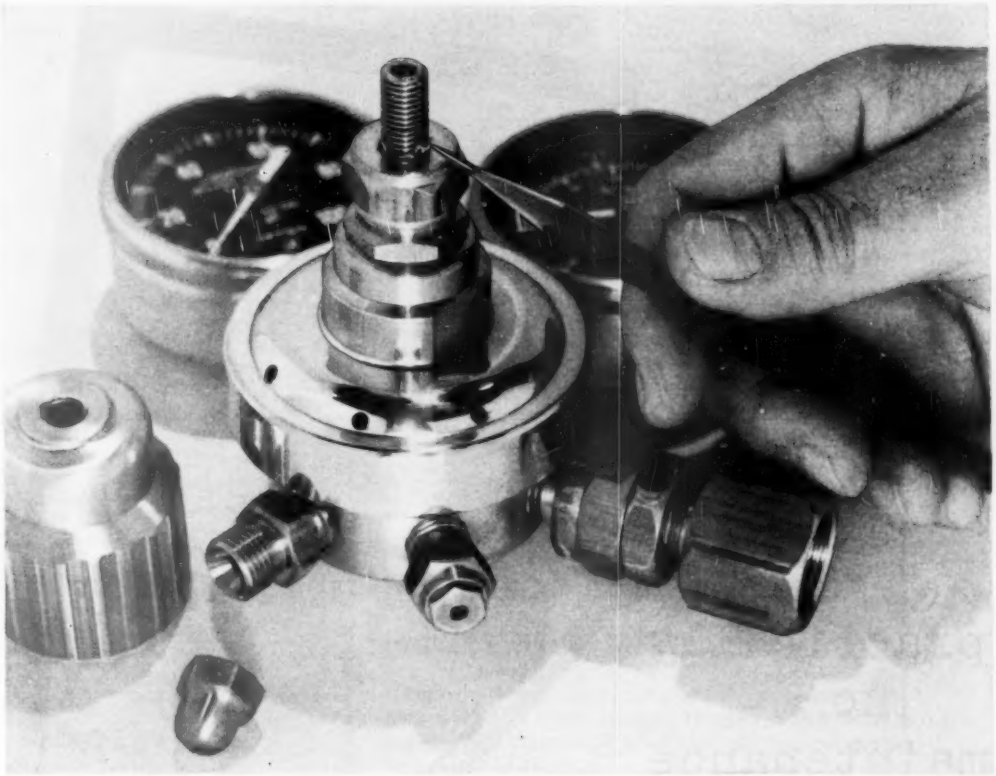
Battelle Institute Started in Germany

THE cornerstone of the Battelle Memorial Institute for Germany was laid at Frankfurt-am-Main, Germany on Oct. 31. It is being established by the Battelle Institute at Columbus, O.

Simultaneously, Battelle Director Clyde Williams announced that another research center will be set up at Geneva, Switzerland. It includes a program of fellowships for selected students in the universities of both Switzerland and Germany. Other Battelle research centers and fellowship programs for still more countries of Western Europe are being contemplated.

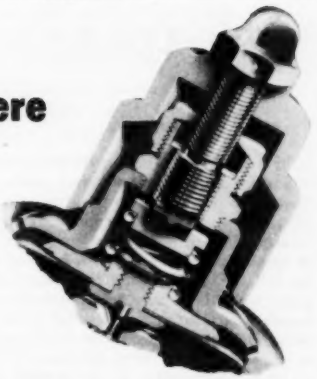
The Frankfurt research center will engage in chemical, metallurgical and engineering research. It is being built on a site presented for the purpose by the City of Frankfurt. The laboratory will cost an estimated million dollars and another half-million will be needed to equip it.

(More News on Page 82)



sealed in smoothness . . .
neither dirt nor trouble can enter here

Tension screw wear and sticking is a sign of poor design and inadequate manufacture—it is not necessary for you or your operator to struggle with regulator tension screw adjustment. The answer to this problem is simple—*keep foreign matter out of the threaded parts.* This tension screw is fully protected by a unique packing and a special type of friction bushing. Just try this regulator tension screw—adjust it yourself and feel how smoothly it works; you can reach maximum delivery pressure effortlessly.



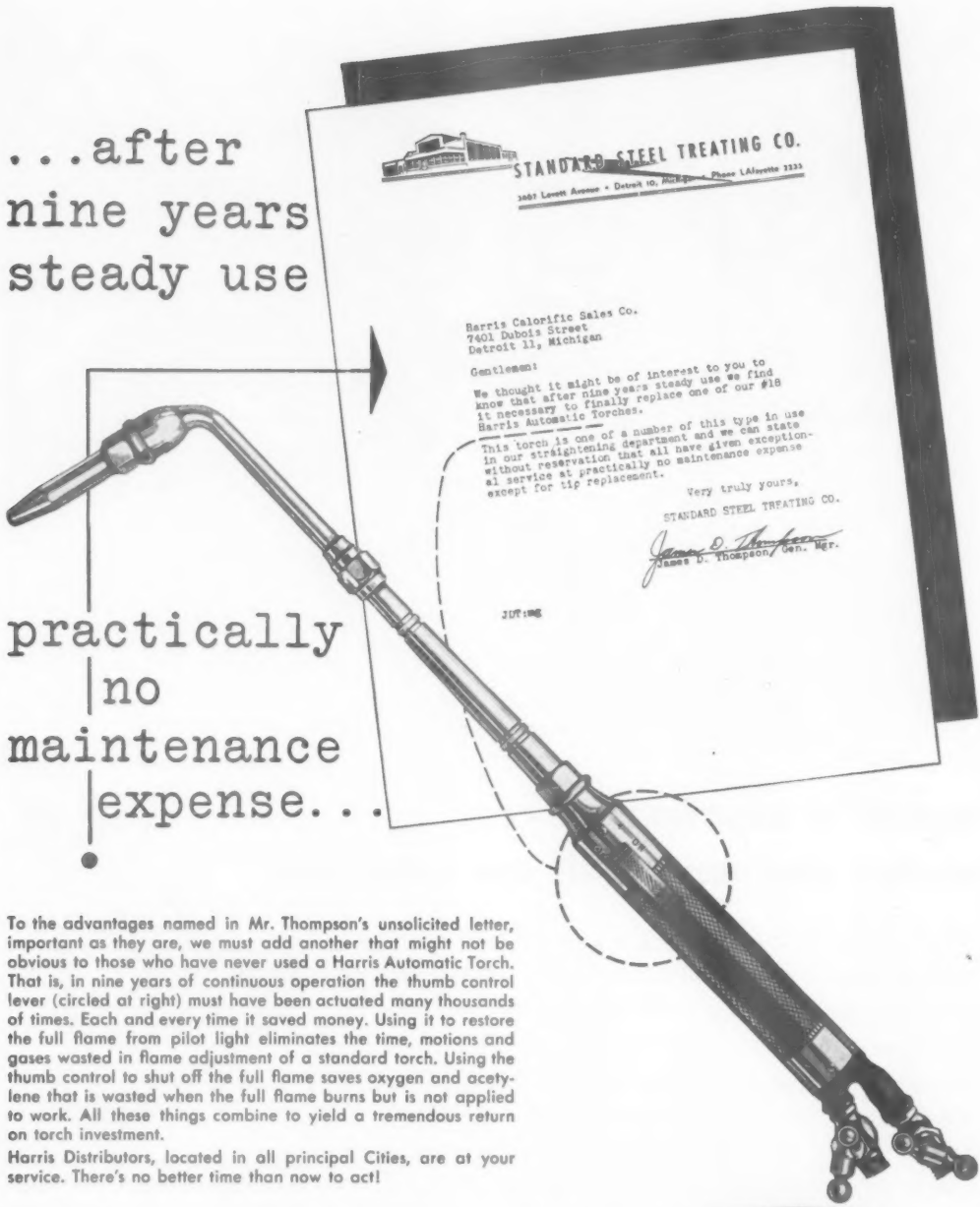
this is the inside story of a wonderful improvement in tension screw design and action. *No other regulator has this patented feature . . .*

Made by National SINCE 1910 **WELDING EQUIPMENT CO.,** San Francisco 5, California

524

...after
nine years
steady use

practically
no
maintenance
expense...


STANDARD STEEL TREATING CO.
2087 Lovett Avenue • Detroit 10, Michigan • Phone LAfayette 2233
Harris Calorific Sales Co.
7401 Dubois Street
Detroit 11, Michigan
Gentlemen:
We thought it might be of interest to you to know that after nine years steady use we find it necessary to finally replace one of our #18 Harris Automatic Torches.
This torch is one of a number of this type in use in our straightening department and we can state without reservation that all have given exceptional service at practically no maintenance expense except for tip replacement.
Very truly yours,
STANDARD STEEL TREATING CO.
James D. Thompson, Gen. Mgr.
JDT:MS

To the advantages named in Mr. Thompson's unsolicited letter, important as they are, we must add another that might not be obvious to those who have never used a Harris Automatic Torch. That is, in nine years of continuous operation the thumb control lever (circled at right) must have been actuated many thousands of times. Each and every time it saved money. Using it to restore the full flame from pilot light eliminates the time, motions and gases wasted in flame adjustment of a standard torch. Using the thumb control to shut off the full flame saves oxygen and acetylene that is wasted when the full flame burns but is not applied to work. All these things combine to yield a tremendous return on torch investment.

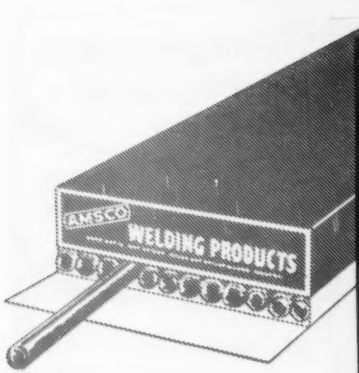
Harris Distributors, located in all principal Cities, are at your service. There's no better time than now to act!

THE HARRIS CALORIFIC COMPANY

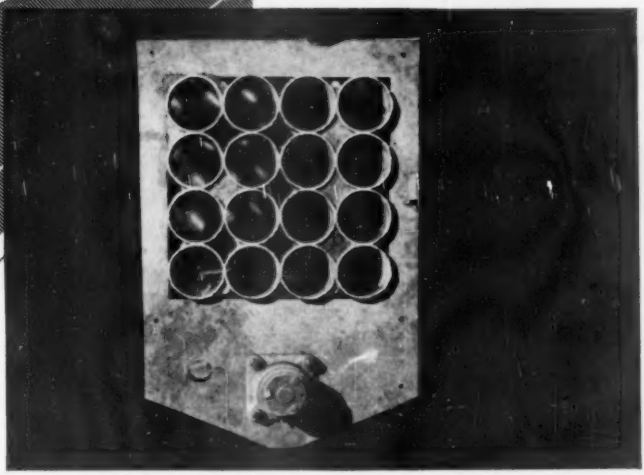
Cleveland 2, Ohio

HARRIS

SERVING THE METAL INDUSTRY SINCE 1905



How AMSCOATING
with Amsco Hardfacing Rods saves you
materials... manpower... money



Amscoating these briquette machine dies increases die life... reduces need for repairs

How to AMSCOAT briquette machine dies

This procedure sheet gives complete details... the Amsco electrode to use and method of application. Also lists recommendations for other iron and steel applications. Free copy on request.

A big reduction in costs of die maintenance has been made by Amscoating with Amsco Economy Hardface "C," according to the welding superintendent of a southern plant manufacturing ferro silicon briquettes.

By using 100-110 amperes reverse polarity and depositing one pass of Economy Hardface "C" on edges of both sides of die, the need for repairs was substantially reduced.

Amsco Economy Hardface "C" is preferred because of its better service results and because of its better handling during application than types of rods used previously.

Long service life and fewer replacements through the use of Amscoating on applications means big savings. If you have equipment that is subject to wear, the possible savings to you are too big to be overlooked!

Write today for illustrated catalog—and nearest distributor's name.

AMSCOATING
THE RIGHT WAY TO MAKE REPAIRS

Brake Shoe **AMERICAN MANGANESE STEEL DIVISION**
382 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que.
Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

These "Firsts" Helped Westinghouse Customers

USERS OF WESTINGHOUSE TUBES GET FIRST BENEFITS FROM MANY NEW TUBE DEVELOPMENTS

These are only a few of the "firsts" that Westinghouse created in the electronic tube industry. In each case, designers using Westinghouse Tubes gained advantages by having first chance to use these innovations.

Today, Westinghouse still pioneers in electronic tubes and tube making. For instance, Westinghouse 40 KV and 20 KV rectifying tubes are under 9 ounces, only 2¾" high. Designers seeking the ultimate in space and weight savings will find them in these new WL-6102 and WL-6103 tubes.

Radical new developments in other power tubes and receiving and television picture tubes are now being engineered at the *NEW* Westinghouse Electronic Tube Division at Elmira and Bath, New York.

NEW SERVICE, NEW DISTRIBUTION

Westinghouse plans for Electronic Tube Division expansion are in operation. New service facilities, new warehousing policies, and new distributors are opening rapidly.

New merchandising methods will aid distributors in serving industrial users—many of these business-building programs are totally new in the tube industry. Here, as elsewhere, Westinghouse plans to provide industry leadership in service.

It pays in profits to deal with Westinghouse and with Westinghouse distributors. For full information on how Westinghouse can help you with problems of design, service, or supply, call your nearest Westinghouse representative, or write to Department D-112.

RELIATRON™ TUBES

YOU CAN BE SURE...IF IT'S Westinghouse

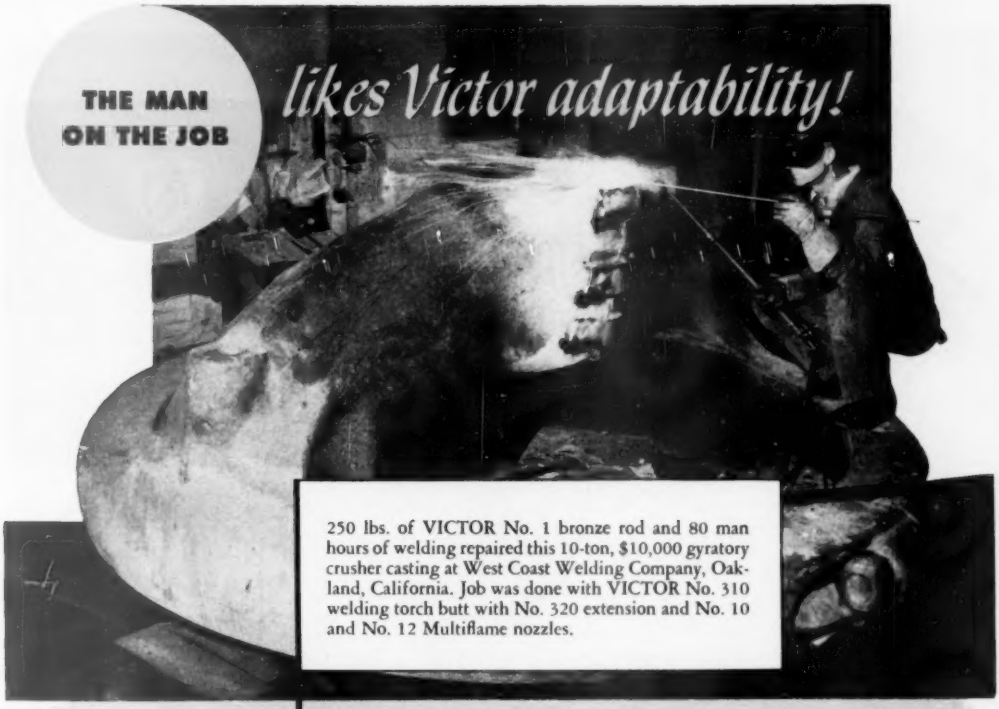
ET-95003

ELECTRONIC TUBE DIVISION

Westinghouse Electric Corporation
Box 284, Elmira, N. Y.

THE MAN ON THE JOB

likes Victor adaptability!



250 lbs. of VICTOR No. 1 bronze rod and 80 man hours of welding repaired this 10-ton, $10,000 gyratory crusher casting at West Coast Welding Company, Oakland, California. Job was done with VICTOR No. 310 welding torch butt with No. 320 extension and No. 10 and No. 12 Multiflame nozzles.

Whatever the job . . . welding, cutting, heating, brazing, descaling . . . you'll start it quicker, finish it sooner with versatile VICTOR equipment.

Here's why:

- HAND-TIGHT QUICK-CHANGE nozzles and cutting attachments are on or off with a twist of the wrist —no wrench needed!
- STEADY FLAME—set VICTOR torch ball-point control valves to the flame you want and it *stays!*
- EFFICIENT MIXING in VICTOR'S exclusive spiral mixer and gas proportioner means peak performance at every setting, with every type of VICTOR nozzle.

LOOK FOR THE VICTOR DEALER SIGN

Ask him to show you why it *pays* to standardize on VICTOR.

VICTOR

GET THE FACTS—AND YOU'LL GET VICTOR

297

VICTOR EQUIPMENT COMPANY

3821 Santa Fe Ave.
LOS ANGELES 58

844 Folsom Street
SAN FRANCISCO 7

1312 W. Lake St.
CHICAGO 7

"Here's a swell welder's glove, Joe!"

Yes, it's

AO HEAVY DUTY HORSEHIDE

Best for Flexibility, Heat Resistance, Wear

"Shake hands" with AO's "super" line of hand protection for welders. Each glove and mitten is 14" long . . . has a smooth finish . . . improved heavy weight soft lining on back for greater protection . . . quality edges bound with tape and stitched. These are features which make this chrome-tanned *horsehide* line better than ever. Test them on the job. *See* the difference! *Feel* the difference! Your nearest AO Safety Products Representative can supply you.

TX100 Gunn cut—one piece back. Double thickness of leather on first finger and thumb, also on portion of palm. Lined on back from wrist to finger-tips.

5X163 Gives exceptional resistance to heat on gas welding and heaviest amperage electric welding. One-piece back and palm. Welted at all vulnerable seams. Extra heavy lining on back of hand.

TX200 Gunn style. Standard size (11) also sizes 10, 12. Welted seam at base of palm and wrist. One-piece back. Wing thumb.

6X141 One-piece back and palm. Crotch of thumb reinforced with wide leather strap. All vulnerable seams welted for extra protection. Back of hand is lined.

Also ask to see and test the other six gloves and mittens in this top quality AO line.

American Optical Company
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

WEAR-ARC

A PENNY'S WORTH OF HARD-FACING ELECTRODES CAN SAVE A DOLLAR'S WORTH OF COSTLY REPLACEMENT PARTS

This is just one of innumerable everyday applications for Alloy Rods Company's famous *Wear-Arc* hard-facing electrodes. There are nine basic types of *Wear-Arc* and *Wear-Flame* electrodes for every conceivable hard-facing requirement. If you have a hard-facing problem, let Alloy Rods' experienced engineers give you competent advice! *Write for Bulletin 5651.*

LOOK FOR THE FLAMING ARC TRADEMARK

Manufacturers of **Arcaloy** stainless steel electrodes • Bronze-Arc phosphor bronze electrodes • Nickel-Arc and Nickel-Arc 60 electrodes for cast iron • Tool-Arc electrodes for tools and dies • Weld-Arc low hydrogen electrodes. Write for Bulletins on these products.

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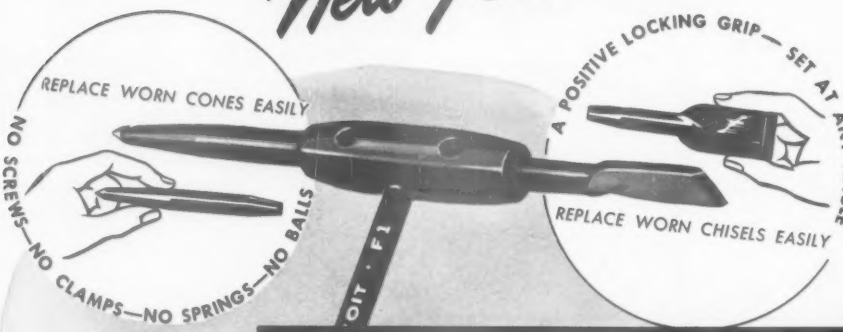
NO FINER ELECTRODES MADE... ANYWHERE

There's Never Been Anything Like It For *New Features!*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—Because you use it over and over—Replace only the lost cost bits—just as you replace only the tip in your cutting torch.

Model E 1 — Flexo handle — 12 ounces
Model F 1W — Flexo handle — 16 ounces
Model E 1W — wood handle — 12 ounces
Model F 1W — wood handle — 16 ounces

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IT'S BETTER THESE WAYS:

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1. Rexweld builds up and holds on an edge better! This means less welding time is required.

INCREASE PRODUCTION

2. Rexweld flows more readily on flat surfaces! In machine gas welding operations valve companies have reported an increase in production per shift using Rexweld.

LESS POROSITY TENDENCY

3. Rexweld has less tendency for porosity because of its smoother flowing and better wetting properties.

BETTER WEARING QUALITY

4. Tests show Rexweld has better wearing qualities.

Hundreds of satisfied users, manufacturing such products as valves, oil pump parts, mixer shafts attest to Rexweld's ability to do a better job . . . at less cost! Rexweld is available in a wide range of grades to meet all requirements. Then too, Rexweld meets Government specifications. If you use hard surfacing rod, be sure you check Rexweld . . . it'll save you time and money.

CRUCIBLE **REXWELD HARD SURFACING ROD**

52 years of Fine steelmaking

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REZISTAL STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

FOR LOW HYDROGEN ELECTRODES

Weldrod coatings with TAM Ruflux T increase the speed with which a slag sets up while providing better slag control. Ruflux T is a compound containing approximately 91.5% ZrO and 5.4% SiO_2. Mesh size is approximately 0.1% on 325 mesh. Detailed information is easily obtained by writing our New York City Office.

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FIRST in DESIGN — Original design features created by Banner make it first and foremost in the welding field.

FIRST in QUALITY — Built to highest engineering standards. True quality construction throughout.

FIRST in PERFORMANCE — Does your job faster and better, to raise plant production and efficiency.

ONLY BANNER OFFERS ALL THESE FEATURES...

★ Banner Welders can continuously and accurately weld up to 225 spots a minute.

★ Time tested proof of a Banner development is the original design of ram and cylinder and the long bearing surface of 7".

★ Up to 7" adjustment on lower knee. (Unit is available up to 30" throat.)

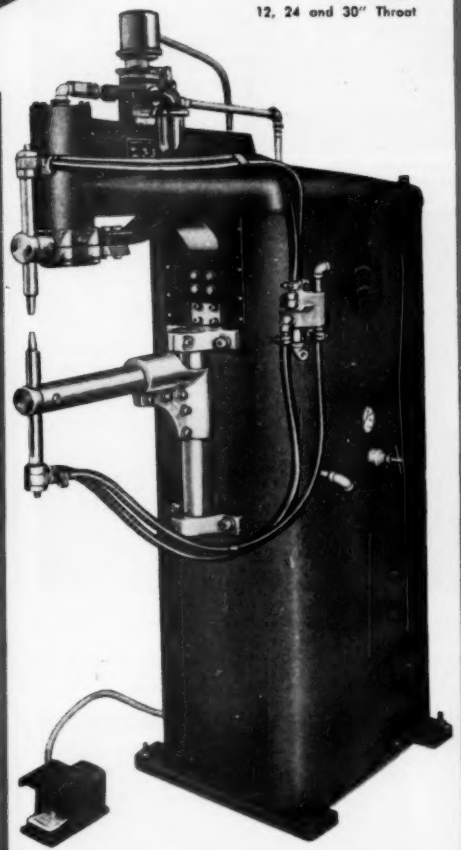
★ Heavily ribbed cast iron head, with integrally cast cylinder provides utmost rigidity. Manganese Bronze piston specially equipped with 3 cast iron double seal (automotive type) rings reduces friction up to 50%, thus permitting necessary follow-up after welding cycle.

★ Heavy duty selector with contacting pads of ample cross section provides 8 stages of heat regulation.

★ Secondary and secondary pads are water-cooled assuring dissipation of heat in high speed operation.

Banner manufactures a complete line of Gun, Seam, Rocker Arm and larger Press Welders to 200 KVA and Specials. Inquiries invited.

BANNER
SPOT WELDER
Model SPA
10, 20, 30 and 50 KVA
18" Throat shown
Also available
12, 24 and 30" Throat



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where jobs are *Toughest*

NCG® makes its strongest friends

Lee C. Moore Corporation, Tulsa, one of the country's foremost builders of oil well drilling and production masts and structures, is a user of Sureweld Electrodes, has 18 Sureweld AC Welders, uses NCG gases exclusively.

The tough jobs—those that demand unusually high performance under exacting conditions, that require *extra* ability-to-perform—are the ones that put equipment to a real test.

It's on jobs like these that NCG welding and cutting equipment proves most convincingly that it's *built better* to do *better work*, because that extra ability-to-perform is so evident.

Why not find out what NCG can do for you? The literature offered you on the opposite page explains the superiority of NCG's welding, brazing and cutting equipment. Use the convenient coupon to check the literature you wish to receive.

ABOVE: Sureweld Electrodes in use at Harris Structural Steel Company, New Market, New Jersey, one of the nation's largest fabricators of steel bridges and buildings.

ABOVE: An NCG Type R cutting machine is used for shape cutting in the diversified maintenance operations of Esso Standard Oil Company's big Baton Rouge refinery. For production cutting, as many as eight torches can be mounted on the Type R.

BELOW: Eleven Sureweld Spot Welders are in use at the Dunnington Mfg. Co., Indianapolis. Operators make an average of 4,850 welds daily without fatigue. Savings over previous soldering operations are estimated at over $150 per month.

BELOW: At the Neville Island plant of Shanango-Penn Mold Co., Pittsburgh, Torchweld cutting torches are used to remove "staples" from 6-ton ingot molds. Shanango-Penn has used NCG products for 15 years

USE THE COUPON BELOW FOR HELPFUL NCG® PRODUCT LITERATURE

1 SUREWELD A-C WELDERS

Twelve page catalog fully explains and illustrates the performance and construction features of Sureweld A-C welders. Includes both general utility shop models and heavy duty industrial models.

2 CUTTING AND WELDING APPARATUS

Catalogs on the Torchweld and Rego lines of oxyacetylene welding, brazing and cutting torches, tips, regulators, outfits and other apparatus.

3 SUREWELD "GASARC" INERT-ARC WELDERS

Brochure describes Sureweld "Gasarc" Welders and auxiliary equipment for inert-arc welding. Five models available ranging from 150 to 500 amp. ratings.

4 PORTABLE CUTTING MACHINE

Illustrated catalog describing the famous Cut-O-Matic—NCG's portable automatic motor-driven flame-cutting machine. Cuts straight lines, circles, arcs and bevels. Weighs less than 50 pounds.

5 SUREWELD PORTABLE D-C WELDER

Complete information on the popular Sureweld gas-engine driven D-C Welder which combines ample welding capacity with one-man portability. For field welding, maintenance and repair.

6 POWDER-CUTTING EQUIPMENT

Newly-issued brochure describes NCG's new Ferrojet equipment for cutting stainless and other "hard-to-cut" alloy steels. Also new flame-washing torch for removing riser pads on alloy castings.

7 NCG CYLINDER MANIFOLDS

Sixteen-page catalog describes and illustrates all sizes of NCG cylinder manifolds for economical piped distribution of oxygen, acetylene, hydrogen and nitrogen.

ADDITIONAL NCG PRODUCT LITERATURE

8 Sureweld Portable Spot Welder
9 Sureweld Electrodes
10 NCG Brazing & Welding Alloy Rods
11 NCG Multiple-torch Cutting Machines
12 NCG Welding Accessories
13 Sod-R-Braze Air-Acetylene Torch
14 Torchweld Acetylene Generators

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- ☐ 1 A-C Welders
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- ☐ 3 Gasarc Welder
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- ☐ 6 Ferrojet
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- ☐ 11 Cutting Machines
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- ☐ 13 Sod-R-Braze
- ☐ 14 Generators

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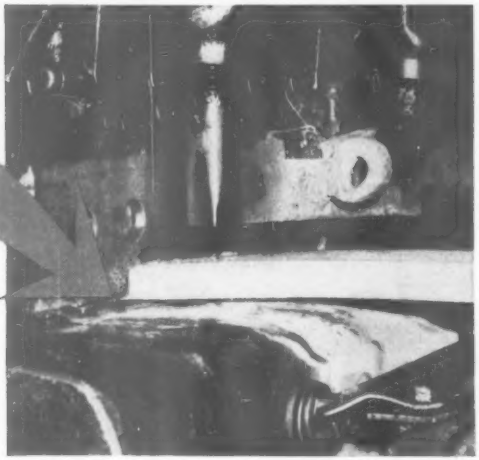
HOT SHEAR BLADES STAY SHARP...when Hard-Faced with HASTELLOY Alloy C

TRADE-MARK

A 3/32-in. deposit of HASTELLOY alloy C on the cutting edge of this shear blade has increased its life by four times. The edge can be rebuilt again and again, when it finally does wear.



This shear blade is used in a plant producing tough non-ferrous alloys. Before hard-facing was adopted, the blades would chip, lose their edge, and have to be scrapped after shearing only about 50 tons of metal. They now can handle roughly four times that amount of metal because they are protected with HASTELLOY alloy C. They can be machined and hard-faced again when they finally do wear. One set of hard-faced blades has been in use in the plant for more than three years with periodic maintenance.

In steel mills, too, HASTELLOY alloy C has increased the life of blooming mill shears by as much as 10 times. Hard-faced blades have lasted 110 turns without maintenance.

HASTELLOY alloy C rod has also been applied to many other hot-working parts with outstanding success. The metal flows well by metallic arc welding or HELIARC welding without preheating. No peening is necessary. Deposits of HASTELLOY C work-harden in service. They can be machined by conventional methods.

For information on how to apply HASTELLOY alloy C to hot-working parts, write for a copy of "HAYNES Hard-Facing Manual." For on-the-job help in applying the rod, get in touch with the nearest District office.

HAYNES TRADE-MARK *alloys*

Haynes Stellite Company
A Division of
Union Carbide and Carbon Corporation
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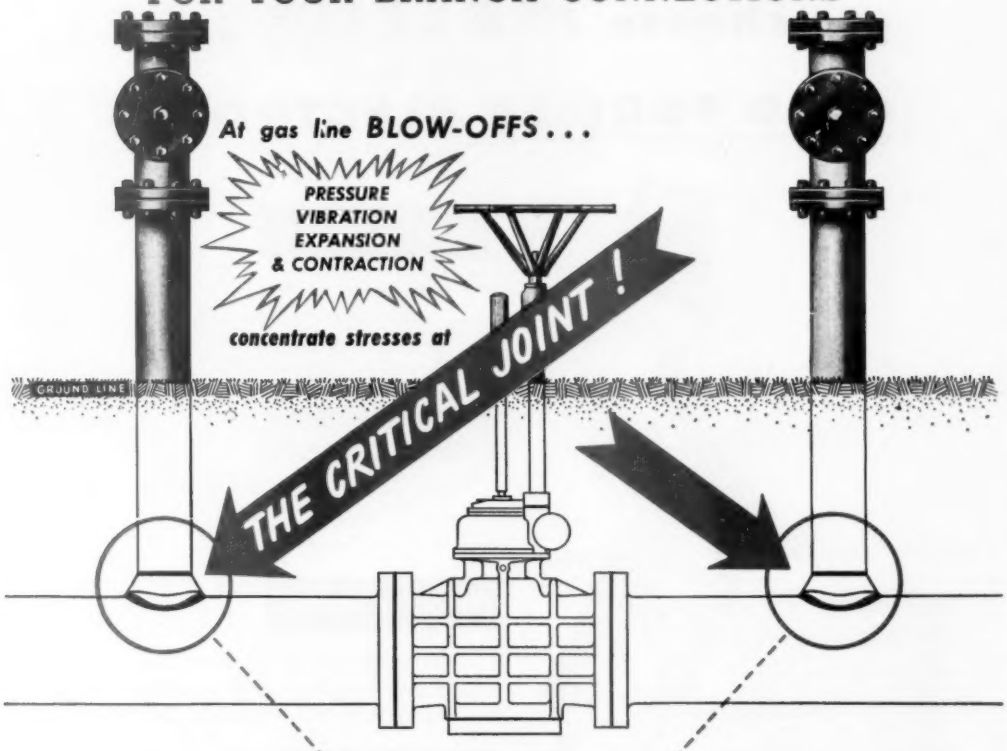
FOR YOUR BRANCH CONNECTIONS



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to insure
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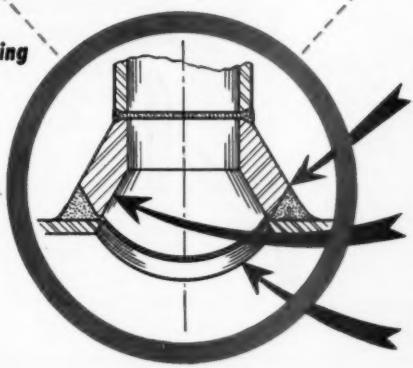

Reinforcement where both the mechanical and internal stresses are most severe

Funneled to relieve mechanical stress concentrations and improve fluid flow

Shaped and beveled for clean, quick and economical installations

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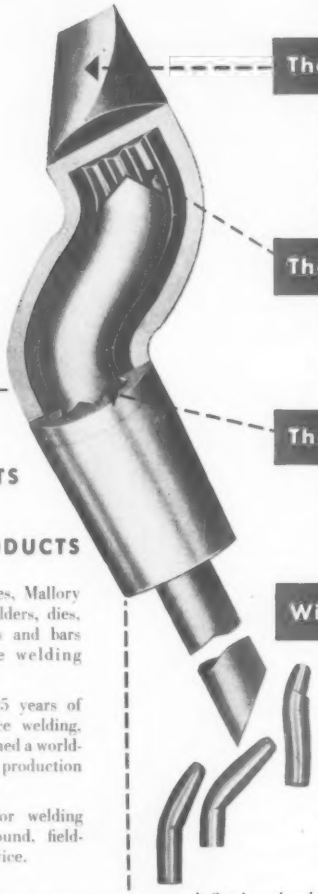
COLD FORMED ELECTRODES



They're tougher

because they are bent cold from full hard rod stock . . . retaining maximum physical and mechanical properties, which can't be equalled by cast or forged electrodes.

They last longer

because cooling water goes all the way to the welding face . . . even on double-bent electrodes. Water tube is bent in place.*

They run cooler

because fluted† cooling water hole—an exclusive Mallory feature—has 70% greater cooling area for higher heat transfer efficiency.

Wide Selection of Shapes

You can probably find *the* electrode for your application in the scores of standard shapes available from Mallory. If you need a special style, send a sketch of your requirements . . . and Mallory will design and cold-form electrodes to your exact needs.

Write or call Mallory today . . . or get in touch with your distributor.

CUT YOUR WELDING COSTS WITH THESE MALLORY PRODUCTS

In addition to electrodes, Mallory offers a full line of holders, dies, castings, forgings, rods and bars for every resistance welding application.

Backed by Mallory's 25 years of experience in resistance welding, these products have earned a world-wide reputation for high production and low-cost operation.

Rely on Mallory . . . for welding equipment and for sound, field-proved engineering service.

In Canada, made and sold by Johnson Matthey and Mallory, Ltd., 110 Industry St., Toronto 15, Ontario

*U. S. Patent 2,489,993 †Patent pending

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Equipment idle or slowed down because of worn-out, broken parts? Down-time eating into profits? Take a tip from Rexarc!

Cost-conscious operators are applying Rexarc at points of wear and impact on all types of earth moving, crushing and abrasive material handling equipment. They're saving thousands of dollars each year in new parts, cutting down-time to a minimum and keeping equipment working longer at bigger profits.

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Within reach of your plant, repair shop or construction job, there's a Rexarc Distributor ready to serve you. Ask him to demonstrate Rexarc's superior running qualities. He will be glad to help you with your build-up and hard-facing problems, too. If you would like his name, write, wire or call

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NOW AVAILABLE IN REPRINT FORM—

"HOW TO WELD STAINLESS STEELS"

A 24-page booklet reprinted from our October issue. This valuable article completely covers all phases of working with stainless steel. It embraces the welding, brazing, cleaning, cutting and finishing of stainless steel. It is well illustrated with photos and diagrams and contains many useful tables.

Features:

WELDING—all processes covered including manual and automatic arc, inert arc, gas welding, atomic-hydrogen and spot, pulsation, projection, seam and roll-spot, and flash welding.

BRAZING—How and what to use when brazing stainless.

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Prices For Reprints: 1 to 25—$0.20 each
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Send your order to:

THE WELDING ENGINEER

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Only P&H AC Welders have this feature

for faster, easier, sounder welds on non-ferrous and "hard-to-weld" metals

No other welder has this Instantaneous Control feature. Foot-operated, the control provides the heat you call for instantly, *electrically* — not mechanically. No time lag. It's a P&H exclusive that boosts production, cuts costs, saves time.

Inert Gas Welding

Instantaneous control lets you handle "hard-to-weld" metals with ease — aluminum, magnesium, brass, copper, stainless, high carbon, high alloy, and low carbon steels. You get sound welds — X-ray quality every time. No burn-throughs, fewer rejections.

Operators like it, too. It gives them faster, better welds in only five simple steps. Check them:

1. Foot switch automatically turns on power, high frequency, water and gas.
2. Arc starts *instantly* without touching work.
3. Foot switch control provides exact heat needed *while* welding — *no time lag.*
4. Foot-operated control cuts power either gradually or instantly at completion of weld. Eliminates craters — no scrap pieces needed to ruf out bead.
5. Gas and water shut off automatically according to pre-set time delay.

Compare AC Inert Gas Welders, point by point, and you'll buy P&H. Check these outstanding features:

- **P&H Dial-lectric Control** — No moving coils or cores to bind or freeze. Maintenance is absolutely negligible.
- **Built-in high frequency unit** — eliminates additional external equipment. Variable frequency control.
- **Automatic gas and water control** — Pre-set automatic time delay control (2 seconds to 2 minutes) prevents electrode contamination, assures clean, sound welds.
- **Stepless amperage regulation** — from 10 amps to maximum. Three models available — ranges 200, 300 and 500 amps.
- **Unusual arc stability** — Makes good clean welds where extremely low amperages are required.
- **Selector switch** — gives operator instant choice of standard or high frequency unit.

No wonder P&H Inert Gas Welders are the choice of the aircraft industries where top quality work and speed are "musts". They join "hard-to-weld" metals faster and easier — eliminate rejects for you, too. Get full details from your P&H representative or write us for further information.

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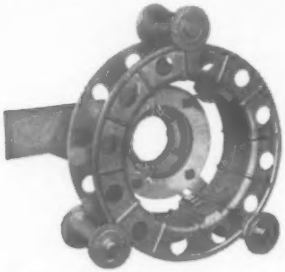
NOW

Double and Triple weight coils for automatic welding with the new REID-AVERY (free wheeling) REELS for Submerged Arc, Open Arc, and Gas Shielded Arc Welding

Raco Reel for 150-200# coils with floor mounting stand.

Decrease down-time by using larger coils. Machines now equipped for 25 lb. coils can use up to 75 lb. coils with these new reels.

These cast aluminum alloy reels ride on ball-bearing trunnions with deep flanges. The wire uncoils with remarkable ease and yet there is no chance of overrunning and throwing loops over the side. No brakes or drags of any kind are necessary. The wire itself prevents overrun. These "free wheeling" reels provide the absolute minimum load on the automatic welding machine.



Raco Reel for 25#-50#-75# coils. Mounted on popular submerged arc machine.

The Reid-Avery reels are available with stands for floor mounting or with special spiders for direct attachment to most popular automatic welding machines. Three reels 12" ID x 4" wide, 14" ID x 6" wide, and 25" ID x 4" wide nominal size are in stock for prompt delivery.

Raco Reel shown split for loading.

Note the simple split reel construction with suitcase type latches. Coils can be replaced in seconds and no wrenches or special tools are required.

We are equipped to supply all sizes of layer wound coils for these reels, for other reels, or on expendable wooden spools where required.

The REID-AVERY COMPANY

INCORPORATED

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SINCE 1919 PRODUCERS OF ARC WELDING ELECTRODES AND WELDING RODS

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SILVALOY

LOW TEMPERATURE SILVER BRAZING ALLOY

Low temperature Silvaloy Brazing is helping to speed and simplify production, cut costs and improve results for manufacturers in many fields.

In the Bendix Products Division plant for example, Silvaloy Brazing is done at peak efficiency. The rotary semi-automatic brazing table shown here has 20 brazing stations, each with movable torches. It was developed by Bendix Engineers for the automotive section of the Bendix Products Division, Bendix Aviation Corporation . . . adding another practical Bendix approach to the efficient manufacture of their products.

Technical assistance for all brazing operations is available to you without cost or obligation. You can have a Silvaloy Technical Expert at your plant without delay, by calling the Silvaloy Distributor in your area.

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APW #1200 Universal Flux may be exposed to extreme heating on large pieces without "breaking down." Easily removed with water, after brazing.

FREE: SEND FOR THIS 48-PAGE "COMPLETE GUIDE TO SUCCESSFUL SILVER BRAZING"

BENDIX engineered this high-production rotary brazing table for the automotive section of the Bendix Products Division. The first operator assembles parts; the second checks alignment and the third removes brazed job from its fixture.

THE AMERICAN PLATINUM WORKS

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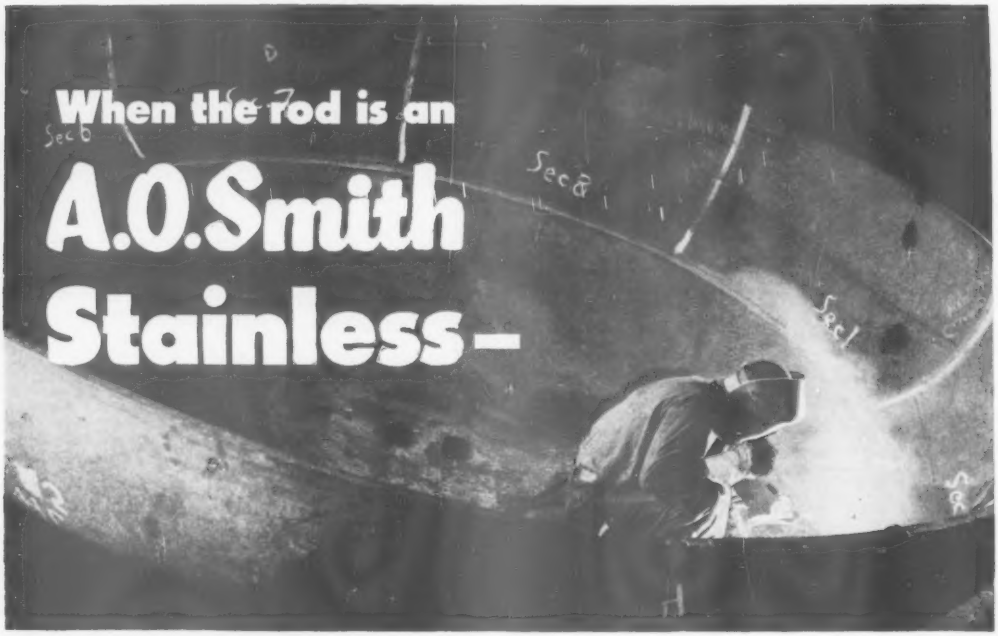

–you know it's right

BECAUSE of A. O. Smith's matchless quality control

You, too, can eliminate field failure due to weld corrosion, with A. O. Smith stainless electrodes . . . your "insurance policy" that *your* specified requirements are met *exactly.*

"Tramp" steel cannot enter for manufacture because our quality control prevents it. No incoming coil of stainless core wire is ever acceptable for processing until exacting chemical, metallurgical and *spectrographic* analyses *prove* that it matches our specifications from end to end. This assures you of receiving the exact type and analysis of stainless to meet your job specification.

For your protection here are some of *our* controls: No more than one splice is permitted in any incoming coil. Why? So that, when we clip samples from each end of each coil for analysis, no part of any coil can escape the test. Then, when approved coils are straightened and cut, the wire is immediately sealed in boxes to prevent mixing of lots.

As one of the largest users of stainless electrodes in building stainless vessels, A. O. Smith knows that these tests and precautions are necessary to assure top-quality production. No other electrode producer subjects stainless core wire to the exacting spectro-analysis, chemical and metallurgical tests as is done by A. O. Smith.

When you buy A. O. Smith stainless electrodes, you receive this matchless assurance of highest quality without paying any premium! A compelling reason for *insisting* on A. O. Smith stainless every time!

We'll welcome the opportunity to demonstrate A. O. Smith stainless electrodes on your job.

Write for free pocket-size electrode handbook.

A. O. Smith Certified Stainless Electrodes

ALL-POSITION

Electrode	AISI Type
SW-151	502
SW-152	505
SW-153	410
SW-154	430
SW-157	347
SW-158	317+Cb
	318
SW-159	310
SW-160	316
SW-161	317
SW-162	308
SW-166	309
SW-168	310+Mo
SW-169	310+Cb
SW-357	347
SW-359	310
SW-362	308

Available through A. O. Smith Welding Products Distributors

Made by welders . . . for welders

A.O.Smith
WELDING PRODUCTS
Milwaukee 1, Wisconsin
International Division: Milwaukee 1

78th ANNIVERSARY 1874 - 1952

See A. O. Smith advertising in TIME and NEWSWEEK.

Welding Info-Aids

201 ELECTRODE CHART—A. O. Smith Corp., Welding Products Div., Milwaukee 1. 6-page folder compares more than 80 AWS electrode designations with the trade names of 14 major manufacturers. Mild, low alloy and stainless electrodes are included in this complete listing. A code explanation and chemical composition chart of AISI stainless steels is included.

202 COPPER ELECTRODE—Krembs & Co., Chicago. 4-page pocket-size folder describes the new "Kop-R-Arc" electrode for welding copper and copper alloys. Instructions on preparing weld joints, welding procedure and copper welding flux are clearly presented. A chart on correct amperages for various diameters of electrode is printed on the last page.

203 SILVER BRAZING—American Platinum Works, Newark 5, N. J. 48-page illustrated silver brazing manual provides correct answers to all low temperature silver brazing, joint design, preformed brazing shapes, plymetals, fluxing, heating methods, cleaning and inspection. More than 100,000 copies of the first edition were distributed; this is the second offered this year.

204 HARDENING COMPOUND—Doughty Laboratories, Inc., New York City 36. Pocket-size folder tells about hardening staple header dies made from AISI 1050 steel to increase service life from 10 impressions to more than 400. Instructions for using the hardening compound, "Hard-N-Tuff," are provided.

205 ENGINE-DRIVEN WELDERS—Hobart Brothers Co., Troy, O. 8-page bulletin describes the complete line of Hobart gas-engine-driven arc welders, welder-generators and welder-auxiliary power supplies. Each model is pictured and its capabilities listed or explained for the pipeline job, farm or shipyard. A cross-section of the Hobart welder is shown as well as a break-down of operation controls.

206 CAST WELDING FITTINGS—Key Co., East St. Louis, Ill. 4-page bulletin describes "Key-Kast" alloy steel welding fittings having extra thickness in critical areas and greater wall thickness throughout. Explanation of design and illustration of various shapes available are included in the bulletin.

207 PORTABLE SPOT WELDER—Ampower Products Co., Oak Lawn, Ill. 4-page bulletin gives full information on the "Ampower" portable spot welder, describing its controllable timer, 1,000-lb electrode pressure, adapters for water cooling, mounting stand for high-speed work and other operating features.

CARDS NOT GOOD AFTER MARCH 1, 1953

TO OBTAIN: (1) manufacturer's catalog or bulletin described on this page; information on (2) a new product item or (3) an advertised product, use the card sections printed below. Insert number of catalog or new products item or page number of advertised product (add initials of the advertiser if more than one ad appears on the page). THE WELDING ENGINEER will ask manufacturers to send the information requested.

Each card section must be completely filled out. Do not use ditto marks. These cards are not good after March 1, 1953.

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208 R-W TIP CONDITIONER—S-M-S Corp., Detroit 11. 4-page folder describes the "Maintain-A-Contour" spot welding tip conditioner. Consisting of a kit, it includes a compact plate holder, a roll of abrasive mounts, precision ground contour plates (for shaping the tip) and all-steel storage chest with recessed handle. Function of every part is shown.

209 A-C AND D-C WELDERS—A. O. Smith Corp., Welding Products Div., Milwaukee 1. 4-page folder pictures the new design of Smith a-c transformer, d-c rectifier and engine-driven welders. Brief description of each is included.

210 RECTIFIER WELDER—Miller Electric Mfg. Co., Appleton, Wis. 4-page three-color bulletin features a personal message from president Niels Miller telling about the company's new selenium-rectifier d-c welders. Four sizes of machine are briefly described and their applications outlined.

211 CUTTING TORCHES—K-G Equipment Co., Long Island City, N. Y. Catalog sheet M-38 tells about the Model M38 cutting torches and the various types and shapes of brass and Monel heads. Cutting tips are clearly pictured and their dimensions tabulated on the reverse side of the sheet.

212 INERT-ARC HARD-FACING—Air Reduction Sales Co., New York City 17. Single sheet bulletin shows equipment and process data for the new automatic "Heliweld Hard-Facing Process" announced and shown at the Metal Show. Equipment needed, currents, voltages, welding speeds, electrodes, carbide size and other essential material are listed.

213 R-W DIE ADAPTOR—P. R. Mallory & Co., Inc., Indianapolis 6, Ind. Bulletin No. 8-22 gives complete technical information on new Mallory resistance welding die adaptors for use in high-speed spot welding production lines. Ease of change-over of tips for short runs and construction features providing good cooling are fully described.

214 ENGINE-DRIVEN WELDER—General Electric Co., Schenectady 5, N. Y. Single-sheet, two-color bulletin tabulates all information on the new WD-42AGW engine-driven d-c arc welder. Its air-cooled engine, welding characteristics, applications, optional equipment, governor and trailer provisions are completely listed.

215 NICKEL ELECTRODES—Alloy Rods Co., York, Pa. 4-page bulletin tells about the new "Nickel-Arc 60" electrodes for all types of cast iron welding. Properties of the weld deposit are discussed, such as machinability, ductility, etc. Five pictures show actual uses of the product.

216 ARC-AIR GOUGING—Arcair Co., Bremerton, Wash. 4-page, two-color bulletin starts off with a big picture of the "Arcair" carbon and compressed-air torch for fast gouging and cutting of mild and stainless steels. How it's used in foundries, fabricating shops and maintenance departments is pictured and instructions for operating it are also included.

217 ALUMINUM SOLDER—Johnson Mfg. Co., Mt. Vernon, Ia. 4-page folder features a complete description of "Alumaweld" solder for aluminum, aluminum-bronze, cast iron, cast steel and other alloys. Temperatures, fluxes and special solders for magnesium and die-cast metals are also listed. Given prominent display are various soldering fluids, fluxes, pastes, acid brushes and core brushes.

218 OXYGEN PLANTS—Air Products, Inc., Allentown, Pa. 12-page catalog No. 52 tells about making your own oxygen and nitrogen from air. Depicted and explained are tonnage oxygen-nitrogen generators, high-purity generators and equipment for other low-temperature processes.

219 AIRCOMATIC WELDING—Air Reduction Sales Co., New York City 17. New, 12-page, two-color booklet gives the reader full information on equipment and supplies for inert-gas-metal-arc welding. The profusely illustrated booklet covers in detail both the No. 3 and the new No. 20 "Aircomatic" guns and heads. Welding electrodes for this equipment are also discussed.

220 TANK HEADS—Joseph T. Ryerson & Son, Inc., Chicago 80. Four-page letterhead-size bulletin lists tank heads in stock for immediate shipment. Heads are classified as ASME and standard types of flanged and dished heads suitable for pressure vessels, tanks, boilers and similar applications.

221 ENGINE-DRIVEN WELDER—A. O. Smith Corp., Welding Products Div., Milwaukee 1. 4-page, three-color bulletin gives the complete low-down on the new "Field-King" engine-driven d-c welder developed by A. O. Smith. Its light weight of 965 lb, welding arc characteristics, auxiliary power feature, torsion-bar mounting and Willys L-head or Chrysler engine are described in full.

222 METALLIZING STORY—Metallizing Engineering Co., Inc., Long Island City 1, N. Y. For the complete story of metallizing, this 8-page booklet is recommended. An excellent cross-section of the metallizing gun shows all air, gas and metal passages. Other pages explain the rates and types of metal deposition, applications in many types of industry and typical metallizing installations.

CARDS NOT GOOD AFTER MARCH 1, 1953

Insert number of catalog or new products item or page number of advertised product (add initials of advertiser if more than one ad appears on the page). Fill out each card section completely—do not use ditto marks.

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THE WELDING ENGINEER, DEC., 1952

Remember—the trade marks "tt" and "TUBE-TURN" are applicable only to products of **TUBE TURNS, INC.**

Engineered for extra strength

An important value you get with TUBE-TURN Welding Fittings and Flanges is extra strength . . . at no extra cost.

For example, this TUBE-TURN Welding Tee will withstand more pressure than required by standard codes . . . because it is drawn from seamless tubing to a barrel shape, and because of its generous crotch radius and thickness. Bursting pressures obtained in tests of representative fittings have averaged more than 25% higher than code requirements.

For this extra quality get in touch with your nearby TUBE TURNS' Distributor. You'll find one in every principal city.

Scrappy says: "Aid defense—more scrap today . . . more steel tomorrow."

Write Dept. N-12 for free booklet on Allowable Working Pressures. Use coupon on reverse side.

Be sure you see the double "tt"

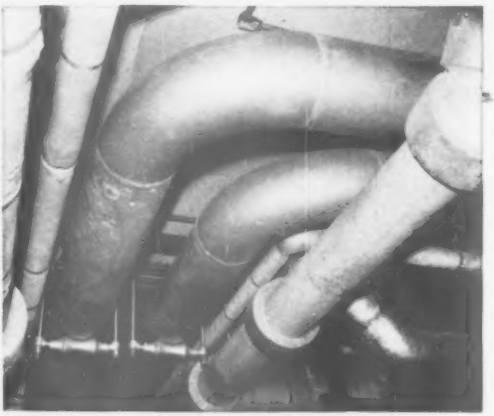
TUBE TURNS, INC. LOUISVILLE 1, KENTUCKY

DISTRICT OFFICES: New York • Philadelphia • Pittsburgh • Chicago • Houston • Tulsa • San Francisco • Los Angeles
TUBE TURNS OF CANADA LIMITED, CHATHAM, ONTARIO... A wholly owned subsidiary of TUBE TURNS, INC.

Welded piping system serves New York Stock Exchange

Long the financial capital of the world, the New York Stock Exchange was one of the first commercial buildings to have controlled atmosphere. Recent additions provide efficient, modern air conditioning to keep the financial mart comfortable at all times.

New installations have been made with a minimum of fuss, in limited space, by use of compact welded piping systems. With TUBE-TURN Welding Fittings used to make directional changes, a permanently leakproof system is assured.



Use of welded piping simplified installation in cramped quarters. Welded lines can be fitted closely together, make a neat installation. Welders like to use TUBE-TURN Welding Fittings, because their consistent dimensional accuracy makes line-up easy, particularly important where space is at a premium.

These 10" and 14" lines carry condenser water to the building's cooling tower. Selection of TUBE-TURN Welding Fittings assures optimum flow conditions, and provides a permanently leakproof system.

TUBE TURNS, INC., Dept. N-12
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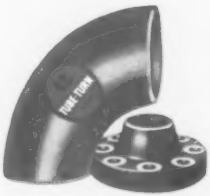

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TUBE TURNS, INC.

LOUISVILLE 1, KENTUCKY

BUTTERING WAS THE ANSWER!

Saved costly casting . . .

allowed use of low cost rods

Need for complete re-making of a large, costly composite machine frame threatened a prominent Western mining equipment builder. Weld metal was picking up harmful impurities from the cast part—it was impossible to obtain satisfactory welds using the electrodes specified.

The local M&T salesman joined with company welding engineers . . . experimented . . . and sparked a solution! On his advice surfaces of the casting where welding was required were simply "buttered" with Murex Type HTS before the bulk of the weld metal was deposited.

Results were: complete elimination of pickup so that remaking of the casting to new metallurgical specifications became unnecessary. And, the specified electrodes, on hand for the job, could be used.

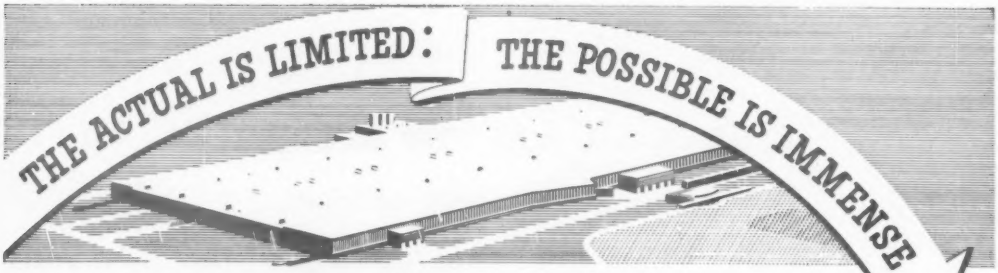
Your nearby M&T representative is qualified to give you expert assistance on any welding problem. Call on him when you need help. Make use of his broad background of experience in every phase of welding.

MUREX®

Electrodes

Arc Welders • Accessories

METAL & THERMIT CORPORATION 100 East 42nd Street, New York 17, N. Y.



NEW LINCOLN PLANT CREATED BY INCENTIVE INSPIRED CO-ACTION IN DEVELOPING POSSIBILITIES IN PRODUCT

© LE Co. 1952

WELDED DESIGN PUTS RIGHT MATERIALS IN RIGHT PLACE TO SIMPLIFY PRODUCTION...CUT COSTS 57%

By **Hugo C. Klix,** Planning & Methods Supervisor
The Lipe-Rollway Corporation,
Syracuse, New York

IN redesigning the bar feed legs for our product, welded design provides a stronger, more durable construction yet one that can be produced from less material and at a 57% saving in cost.

The original design in gray iron (Fig. 1) entailed costly operations of machining and assembly. With our present welded steel design, the shop has simply to saw steel components to length from standard mill shapes. These components are then held in plain clamp-type fixtures and fillet welded with fast, downhand welding techniques.

The welded design also gives the shop greater flexibility of operation. Since patterns are no longer required, former maintenance and storage costs are eliminated.

Fig. 3. Bar Feed *of welded design manufactured by Lipe-Rollway Corporation, Syracuse, New York. Welded steel gives added strength and rigidity, has neater appearance.*

PROPER DESIGN IN WELDED STEEL IMPROVES PRODUCT LOWERS COST

Fig. 1. Machine Stand *originally made from gray iron used steel tube for column. Top and bottom members required milling and drilling. Weight, 54 pounds. Cost,* $22.58.

CUTS COSTS 57%

Fig. 2. Present Welded Steel Design *for maximum economy uses standard steel shapes whenever possible. Weight . . . only 47 pounds. Cost . . .* $9.71 *. . . a saving of* $12.87 *per unit.*

STRONGER, MORE RIGID PRODUCT

Machine Design Sheets available on request. Designers and Engineers write on your letterhead to Dept. 712

THE LINCOLN ELECTRIC COMPANY

Cleveland 17, Ohio

THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

ESTABLISHED 1916

THE WELDING ENGINEER

DECEMBER, 1952

Are You Satisfied?

IT IS DIFFICULT to cram into the last quarter an hour of the afternoon the things that we should have been doing all day long. Yet many in our industry are trying to do just that when it comes to selling welding. Some won't even spend 15 minutes a day.

When I say "selling welding," I don't mean selling welding equipment, welding jobs or welding services to customers who already want them. What I mean is the idea of selling welding to the public so that everyone will want welded products. That's a tremendous job, but, as the Chinese say, a journey of a thousand miles begins with a single step. Let's take that first step now.

Last year over half a billion dollars was spent for welding equipment and supplies. Much of this money went into the metalworking industry. To avoid complications, let's assume that all of it went into metalworking. The metalworking industry produced over $130,000,000,000 worth of finished products during the year. Knocking off a few ciphers, for every $130 worth of metal products sold, only 50c was spent on welding. I can't believe that the metalworking industry is now using welding to its fullest extent.

The American public was saved over $3,000,000,000 last year—a conservative estimate—by the welding that was used in the production of automobiles. Do you have friends who drive automobiles? Did you ever point out to them that welding has made it possible for them to have a better car—one more pleasing in appearance, stronger, lighter and less costly? That's what I mean by selling welding.

THE MANAGEMENT of our metalworking plants hasn't been sold too well on welding in many instances. Management looks upon welding as a production process that must be able to compete with other processes upon an economic basis. Quality is important, but management is always interested in low-cost production. In some instances, management is not sold on welding because it has never been told of the particular process that would do the job.

Maybe gas welding is too slow and metal-arc welding hasn't produced satisfactory results, but inert-arc welding might be just right. No one knew about it so no one tried it. Or if that's too far-fetched, the product is a complicated assembly to be turned out in large quantities. Production brazing in a controlled-atmosphere furnace would save more money than any other process, but to the plant's management welding is a gas torch or a man in a helmet or a spot welder. No one ever took the time and trouble to tell them that welding is not one process but 37. Thirty-seven related joining processes, which are governed by some 28 codes and specifications of the American Welding Society.

The management says the product can't be welded. But do they know that any metal or alloy can be welded with the right process and the right technique? Of course not—no one ever told them.

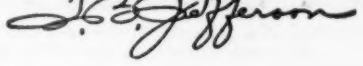
That's what I mean by selling welding.

ENGINEERS, architects and designers who are not familiar with welding constitute another problem. All too often, they are of the opinion that all welds are alike. Because of this misconception, they believe: (*a*) that no weld will fail if properly made or (*b*) that all welds are inherently weak and must be reinforced. Both opinions are wrong; it depends upon circumstances.

There also prevails the unfounded belief that butt welds and fillet welds are similar in fatigue strength and fatigue loading characteristics. Such old and mildewed chestnuts can still exert a disproportionate influence upon the men who count.

Welding first began to hit its stride about the time that the United States entered World War I. People born in that year have now lived half of a normal life span. Think upon the facts that have been accumulated in all that time by the efforts of hundreds of diligent researchers! Yet there are people whose knowledge of welding still dates from 1917. And many of them are executives in high places.

While it is getting late for this year, it is not too late to talk about welding. It isn't a job for the industry—just a fancy way of saying let George do it. It's a job for you and for me. I am not satisfied with what we have been doing. Are you?



LINDE'S News of Metalworking

New Machine Carriage Saves Time On Many Jobs

A new machine carriage in the low-priced field does dozens of metalworking jobs—and does them more quickly, accurately, and uniformly than the most skilled hands. This machine, the OXWELD CM-45, handles practically all machine carriage requirements in small metalworking shops, and supplements heavier equipment in larger plants, shipyards, and mills.

Used on track, the CM-45 is ideal for accurate straight-line cutting. It also cuts top or bottom bevels at practically any angle. With standard radius rods, it cuts circles with diameters of from 2 to 54 inches. To cut larger circles, a longer radius rod can easily be substituted.

Flame-treating work—be it flame-hardening, flame-softening, or low-temperature stress relieving—requires precisely controlled heat. With the CM-45 and appropriate heating apparatus, you get just that; thus you can be sure that each of your flame-treating jobs will be done uniformly.

These are only a few of the jobs that the OXWELD CM-45 Machine Carriage will do for you. Many additional cutting, welding, and heating applications will be suggested by the requirements of your own shop.

The CM-45 saves you time, not only because it does each job efficiently, but also because it is so easy to set up and operate. There is no complicated machinery to master. Its simple design makes it easy to adjust or repair. All parts are readily accessible.

Operating controls consist of a speed-control dial that can be preset or adjusted at any time, and a two-position clutch lever. All controls are grouped together at the rear of the machine for your convenience.

Since the machine weighs only 33¾ lb. complete with cutting blowpipe (as shown in Fig. 1), it's an easy, one man job to move it from one section of your shop to another. The machine's compactness also makes it convenient for use in close quarters where larger machines cannot be used.

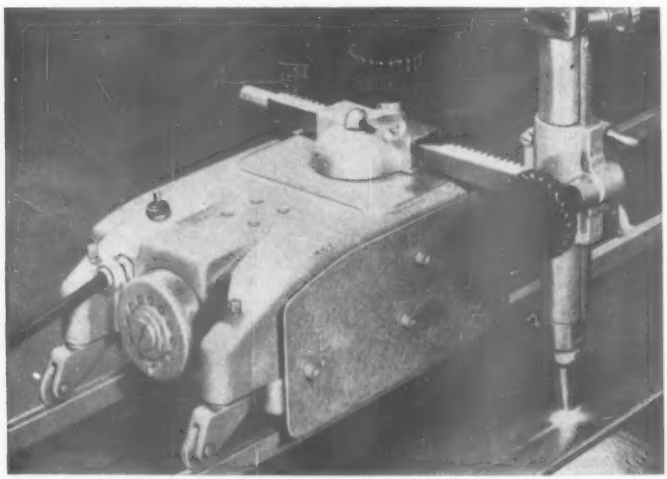


Fig. 1—Cut straight lines or bevels in plate or other steel forms. For all the CM-45's many jobs, a stepless speed range of 4 to 32 in. per min. is available.

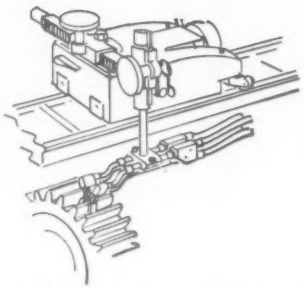


Fig. 2—Flame-treating work requires precise control of applied heat. The CM-45, with suitable apparatus assures you of efficiency and uniformity on every job.

Any LINDE representative will gladly show you how the OXWELD CM-45 Machine Carriage will help you turn out more work in less time. Call the nearest LINDE office today for a free demonstration.

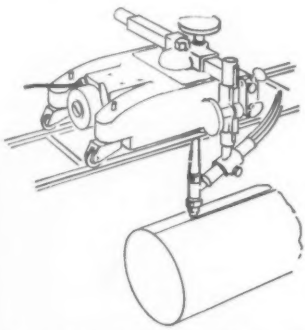


Fig. 3—Do special welding jobs, such as tube fabrication, quickly with the CM-45. Rejects are reduced to a minimum.

The terms "Linde" and "Oxweld" are registered trade-marks of Union Carbide and Carbon Corporation.

LINDE AIR PRODUCTS COMPANY
A Division of Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
Offices in Other Principal Cities
In Canada: Dominion Oxygen Company, Limited, Toronto

C. B. VOLDRICH (left) delivers the Adams Lecture at the American Welding Society's 33rd national fall meeting

Philadelphia—Wow, What a Week!

Were you among those present at the Bellevue-Stratford hotel during the five days from Oct. 20 to 24? If you weren't there, you missed the time of your life.

BY CLYDE B. CLASON

WE WENT to the 33rd annual meeting of the American Welding Society with distinct misgivings. We felt that it couldn't possibly come up to the high standards set by its predecessors. It did. In many respects, it excelled them all.

A change in AWS meeting habits appears to be imminent. Traditionally, the American Welding Society has met in the fall and at one of four cities: Philadelphia, Cleveland, Chicago or Detroit. Now we are to have a "spring technical meeting," scheduled for June 16-19, 1953, in Houston, that may represent a transition to a different arrangement.

Whether at the prospect of staying at the fabulous Shamrock or of holding a show devoted exclusively to welding products, many members to whom the writer talked were looking forward to this event. Certainly the placards lining the walls of the registration room, the lantern slides that were flashed during the beginning and end of every technical session, left no one at the 33rd meeting uninformed as to what is going to happen next June. We have heard that already many requests have been made for hotel reservations and that exhibit space has been selling at a good rate, too.

Getting back to the Bellevue-Stratford hotel in Philadelphia, however, the registration was 1,550, which made this a well attended convention. We think a vote of thanks is due to the national convention committee, Homer R. Morrison, chairman, and to the Philadelphia convention committee, R. A. Guenzel, chairman, which did so much of the work. In particular, orchids should go to J. L. Lang, who arranged the President's Reception, and to K. W. Ostrom, J. E. Norcross and L. D. T. Berg, who planned and followed through on the annual dinner.

A Wonderful Show

With a one-and-a-half hour program of professional entertainment, the annual dinner was as enjoyable an affair as we have witnessed in a month of Sundays. Wisely, the committee omitted all speeches from the honored guests at the speaker's table and let the professionals take over. Frankie Schluth, the man of a thousand disguises, did a side-splitting job as the comedy m-c. Highly enjoyable were those sweethearts of song, Ned Smith and June Sayer, who offered a repertoire of selections from best loved operettas, the dancing team of the Salandias and Ruth Daye, the queen of the xylophone. Most memorable of all, however, was Joe Magrath sitting on the lap of Prince Mendes the prestidigitator and making like a ventriloquist's dummy. Charley McCarthy had better look to his laurels!

Equally well planned and conducted were the plant tours, for which O. C. Fredericks and his group deserve full credit. There were three tours: to the Philadelphia Naval Shipyard, to the Naval Air Materiel Center and to the Steam Division of Westinghouse Electric Corp. at Lester, Pa. The shipyard tour was the most popular, but this writer can't tell you anything about it because he wasn't there. He elected for the Air Materiel Center tour, which included demonstrations of: a catapult shooting a dead test load, an ejection seat (and pilot) being tested under an acceleration of 15 gravities, a fire-fighting drill where a hundred gallons of gasoline went up in smoke and were smothered in a few minutes by trained crews with foam-type extinguishers and an automatically controlled helicopter, the pilot of which played "Look Ma, no hands!" Said pilot afterwards confessed that to do

HOWARD S. Avery, research metallurgist, American Brake Shoe Co., won this year's Lincoln Gold Medal

MYRON ZUCKER (right), head of Myron Zucker Engineering Co., Detroit, receives $750 first prize in Resistance Welder Manufacturers' Association prize contest, industrial class, from J. Roy Barefoot, president of RWMA

his job required "a number of uncoördinated movements coupled with illogical thinking." We didn't get away from welding on this trip because it also included a visit to the sheet metal shop, where large tear-shaped fuel tanks were being fabricated by spot and seam welding.

Good Adams Lecture

Most people who heard the Adams lecture, including your reporter, rated it as one of the very best that was ever delivered. The speaker was Constantine B. Voldrich, of Battelle Memorial Institute, who talked on the welding of titanium alloys. Mr. Voldrich not only did a scholarly job but expressed himself in understandable language.

He had some interesting points to bring out on the metallurgy of titanium, which, rather surprisingly, resembles that of iron in having two types of crystalline structures. Above a transition temperature of 1,620 F for pure titanium, the structure is body-centered cubic (known as beta) and below 1,620 F, it is closely packed hexagonal (alpha form). Alloys of titanium may thus exist in any one of three forms: single-phase alpha type, single-phase beta type and two-phase alpha-beta type.

Voldrich's five-point summary of present knowledge on the welding of titanium was:

1. Titanium alloys are not difficult to weld, but we must be careful to protect the molten weld metal and the adjacent heated base metal from air in order to prevent embrittlement from oxygen and nitrogen pick-up. For this reason, inert-gas welding is the best of the fusion welding processes. It is important in this connection that the back of the joint should also be protected by the shielding gas.

2. We cannot make ductile welds in titanium alloys that contain excessive amounts of oxygen, nitrogen, carbon or hydrogen. Moreover, we cannot use filler metals with an excess of these elements.

3. Alloys of the single-phase alpha type make good weld joints with excellent ductility. The alpha-type includes high-purity titanium, commercially pure titanium and the titanium-aluminum alloys.

4. The high-strength alloys, which are two-phase alpha-beta type, will always present some weld-ductility problems. These alpha-beta alloys may have tensile strengths of from 120,000 to 180,000 psi. For this reason, they are eagerly sought as structural materials by the aircraft and other industries. "If past performance in the welding industry is any criterion," said Voldrich, "we can surely look forward to the time when many of the high-strength titanium alloys will be everyday, familiar materials in our welding work." Before this can take place, however, welding procedures and heat treatments must be developed that will improve weld ductility.

5. Alloys of the single-phase beta type, such as the high-chromium titanium alloys, make ductile weld joints with good strength properties. These alloys should find many applications in welded structures.

Another good job for the convention was done on the Educational Lecture Series, conducted for two late-afternoon periods by Walter H. Wooding, superintendent of the metal test section of the Philadelphia Naval Shipyard. Mr. Wooding told all there was to know about the inert-gas metal-arc welding process, with particular reference to the welding of aluminum. Slides of excellent drawings and photographs made the lectures easy to follow. If Mr. Wooding hasn't yet thought of publishing all this good material in book form, he should get busy on the idea. It belongs between hard covers, so it can be preserved as a permanent reference.

Okay Thoriated Electrodes

Not all the highlights of a convention will be found on the printed program. The writer ran into a bit of important news pertaining to thoriated tungsten electrodes, which offer so many advantages in the inert-arc process. There have been rumors floating around that the addition of thoria made such electrodes a radioactive hazard. Now comes word from the Health and Safety Division of the Atomic Energy Commission that 'tain't so, there's nothing to be scared of.

O. B. J. FRASER, International Nickel Co., receives the Samuel Wylie Miller Memorial medal and citation from Charles H. Jennings at the annual dinner of AWS

FOR LONG years of service, John B. Tinnon (left), Metal and Thermit Corp., and James W. Owens, of Beloit, Wis., were made honorary members of AWS

At a meeting of the AWS Committee on Safety Recommendations, the Atomic Energy Commission group presented the results of its recent study of welding operations under various conditions in which tungsten electrodes containing 2% and less of thoria were used. This study indicated that the atmospheric content of thoria was well below the maximum allowable concentration. Furthermore, in the opinion of the Atomic Energy Commission investigating group, the maximum allowable concentration of 70 disintegrations per minute per cubic meter of air is itself conservative. So the green light is on for thoriated tungsten electrodes!

Awards and Prizes

The number of AWS awards and award winners is growing so large that it is no longer possible to present them all at a single convention session. This year they were spread over four different periods: immediately before the Adams lecture, at the section officers' dinner and meeting, at another dinner and meeting for past presidents and during the annual dinner.

The first awards given were those offered by the Resistance Welder Manufacturers' Association for prize-winning papers. The honorariums were presented by J. Roy Barefoot, president of RWMA and also manager of operations of Federal Machine & Welder Co., Warren, O.

The $750 first prize in the industrial class went to authors Myron Zucker, P. Duker and J. Geralds for their paper, "A Case of Power." Zucker is head of the Myron Zucker Engineering Co., Detroit, Geralds is with the Midwest Wire Products Co., Inc., and Duker is sales engineer of the power division of the Detroit Edison Co.

Second prize of $500 in the industrial division was given to Peter G. Poetto for his paper "Quality Control in a Weld Shop." Poetto is welding engineer with CBC Welding Corp., New York, in charge of quality control program for the resistance welding department.

Third prize of $250, industrial division, was won by authors B. Karniskey, E. H. Kinelski and E. P. Gruca, all in the research and development department of Pullman-Standard Car Mfg. Co., Hammond, Ind. Their paper, "Corrosion of Structural Spot Welds," was published in the Oct., 1952, *Welding Journal.*

In the university class, both RWMA prizes were won by members of the metallurgical engineering department of Rensselaer Polytechnic Institute, Troy, N. Y. This is news of the "dog bites man" class and comes under the heading of to-be-expected events. The paper that won the $300 first prize was entitled "Temperature Distribution During Flash Welding of Steel." The authors were: Dr. Ernest F. Nippes, associate professor of metallurgical engineering; Warren F. Savage, assistant professor; John J. McCarthy, instructor, and Sheridan S. Smith, former research associate, who is now with the National Cylinder Gas Co. in Chicago.

Dr. Nippes also collaborated with John M. Gerken, research associate, in the paper that won the second prize of $200. This paper is entitled "Projection Welding of Steel in Heavy Gages and in Dissimilar Thickness."

This year's Lincoln Gold Medal, a highly coveted honor, went to Howard S. Avery, research metallurgist of the American Brake Shoe Co., Mahwah, N. J. Mr. Avery, who won the same award in 1950, received it this year for a paper entitled "Hard-Facing for Impact."

The A. F. Davis Undergraduate Welding Awards went to promising young engineers at Cornell and Wisconsin universities. Paul J. Wisniewski and David A. Thomas, both Cornell seniors in metallurgical engineering, teamed up to win the first prize of $200 with a paper entitled "Metal Transfer in Arc Welding." A duplicate award of $200 was also presented to *The Cornell Engineer,* which published the paper.

Norman A. Fletcher, who graduated last June from the University of Wisconsin, won $150 for himself and the same amount for *The Wisconsin Engineer* with a paper entitled "Arc-Welded Machine Jigs."

Two men who have contributed greatly to the development of the American Welding Society were made honorary members. Those so honored are: John B. Tinnon, of Metal and

On the social side . . .

RECEPTION LINE. The President's Reception, held traditionally at the cocktail hour on the opening day of the convention, is one of the most popular events

LEFT to right: Mrs. Fred L. Plummer, Fred Plummer, Mrs. C. H. Jennings and C. H. Jennings. Plummer is the new AWS president and Jennings the retiring one

Thermit Corp., and James W. Owens, consulting engineer of Beloit, Wis. Both have worked with the Society since its early days. Life memberships in AWS were also presented to all past presidents at a special dinner presided over by Charles H. Jennings, 1951-1952 national president. Along with these memberships went a certificate of meritorious service.

The Henry Neitzel membership awards were held over for the section officers' dinner and meeting on Tuesday evening. The bronze plaques this year went to the Houston section, which was first in the number of new members gained, and to the Toledo section, which was first in percentage gained. Top ten sections from the standpoint of members gained were: Houston, Cleveland, Los Angeles, San Francisco, Boston and New York (tie), Pittsburgh, Long Beach, Puget Sound, Toledo and Chicago (tie) and Philadelphia. From the percentage standpoint, the top ten places were: Toledo, Houston, Long Beach, Chattanooga, Western Massachusetts, Colorado, San Francisco, Puget Sound, Portland, Ore., and Los Angeles.

Miller Medal to Fraser

One of the greatest honors that the Society can bestow is the Samuel Wylie Miller Memorial Medal for "meritorious achievements in the art of welding." This year's presentation took place during the annual dinner, and was made by President Jennings to another past-president, O. B. J. Fraser. Fraser, who is assistant manager of the development and research division, International Nickel Co., Inc., New York, was selected for this high honor because of his studies of field applications and promotion of welding research, studies that have contributed greatly to bridging the gap between welding art and welding science.

Also during the annual dinner, the Adams Lecturer Award was presented to C. B. Voldrich.

Besides these special events, the convention included 21 technical sessions, at which a total of 68 papers were read. Unfortunately, the programming did not seem to be as well done as the other events of the convention. In the opinion of your reporter, there was far too much emphasis on specialized research studies and not nearly enough given to interest the practical man. To make it worse, much of the research was way up in the stratosphere and beyond the comprehension of a large portion of the session attendees. When one of the authors was asked what reason he had for undertaking his particular brain-tasking study, he replied, "To increase the sum total of human knowledge." That seemed to be about the aim of many researchers. However, we are reminded of Faraday's classical answer when queried as to the value of his discovery of electromagnetic induction: "Some day you can tax it." So perhaps we'd better shut up.

There were three resistance-welding sessions at which a total of ten papers were given, two inert-arc sessions with six papers and a single paper upon gas cutting. What happened to the oxyacetylene industry?

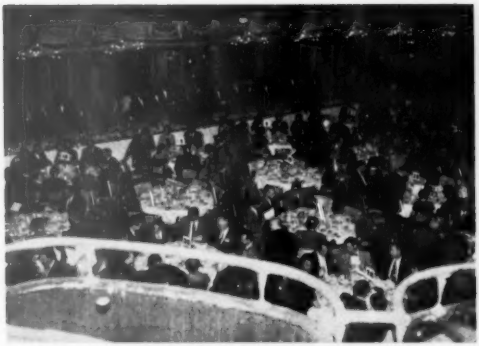
Titanium Titanic

A feature of the convention was the large amount of wordage allotted to the new metal titanium. One entire technical session was given over to titanium and the overflow spilled over into a resistance-welding session and into a session on non-ferrous metals—six papers in all, besides the Adams Lecture.

The first titanium paper, given at the Tuesday morning session on resistance welding, was read by Frank W. McBee, Jr., one of three co-authors from the University of Texas. The subject was the spot welding of titanium-base alloy sheet. An investigation of the physical properties of spot-welded 22-gage Ti-100A reveals that this commercial alloy is quite weldable by spot welding.

A paper on the welding and forming of titanium by Francis H. Stevenson, Aerojet Engineering Corp., took up the welding of a Ti 75-A alloy by inert-gas welding. A helium atmosphere was found easier with machine inert-gas welding, while argon was better with manual welding.

Contaminants found in the welding of titanium were discussed by R. W. Huber, I. R. Lane, Jr., and J. C. Barrett, all of the Bureau of Mines. Experimental determination on the effects of several contaminants on the mechanical properties of titanium weld metal is being carried out by adding known amounts of oxygen, nitrogen, hydrogen and water vapor to the protective helium atmosphere.



MAN ALIVE, what a big show they put on at the annual dinner! Anybody who didn't have a good time was deaf, dumb and blind—besides being a chronic grouch

COCKTAIL PARTY. Steaming hors d'oeuvres and other refreshments were served at the lavish cocktail party staged by the Metal and Thermit Corp., New York City

Thermal cycles adjacent to arc welds were investigated by E. F. Nippes, J. M. Gerken and B. W. Schaaf, all from Rensselaer Polytechnic Institute. Thermal cycles were determined for points adjacent to arc welds in ½-in. titanium plate at energy inputs of 20 to 50 kilojoules per inch. In future work on titanium alloys, these investigators plan to correlate hardnesses and microstructures adjacent to arc welds with those at points of equal cooling rates along Jominy bars.

The welding of titanium alloyed with elements to act as beta stabilizers (beta is the body-centered cubic structure existing above 1,620 F in pure titanium) was studied by G. E. Faulkner, G. B. Grable and C. B. Voldrich, of Battelle Memorial Institute. Iron, manganese, chromium and molybdenum are four of the elements that act as beta stabilizers and strengthen the metal. In general, the tests conducted to date show the lower composition alloys to possess fair ductility in the as-welded condition, while alloys in the intermediate and higher composition ranges are brittle as welded.

Another investigation of titanium welding by the inert-arc process was conducted by John J. Chyle and Ivan I. Kutuchief, of A. O. Smith Corp., under a contract with the Watertown Arsenal. Welding in a completely enclosed chamber, comparisons were made between helium and argon gas for shielding. Groove design, welding sequences, method of bead deposition and welding direction (forehand or backhand) were also studied.

Howard S. Avery, twice winner of the Lincoln Gold Medal, collaborated with Henry J. Chapin, both of American Brake Shoe Co., in an excellent paper concerning the uses of the high-chromium irons for hard-facing. These materials are essentially cast iron with a carbon content of from 2½ to 5% and chromium of from 25-30%. They may have pearlitic, martensitic, austenitic or mixed matrix structures. The two main types are the austenitic, with 28% chromium, 5% carbon, 6% manganese and 2% silicon, and the martensitic with 2.5% carbon (type HC-250). Except where hot hardness above 1,200 F and creep resistance are required, or where high-stress abrasion occurs, the austenitic chromium irons are desirable substitutes for chrome-cobalt-tungsten alloys that cost three times as much, said Mr. Avery.

Jack J. Barry, Air Reduction Sales Co., gave a round-up of the various processes available for hard-facing, citing their advantages and disadvantages. High hardness, he said, is not necessarily the criterion for good abrasion resistance—as an example, aluminum bronze on mild steel.

Wear and operation problems in the maintenance of a steel mill were treated by Frank J. Gaydos, of the Gary Works of United States Steel Corp. It is interesting to note that the Gary works has 13 "doodlebugs" or portable welding shops in service, with three more on order for maintenance welding operations. Each of these self-propelled vehicles carries oxygen and acetylene cylinders, welding and cutting torches, and either a 300-amp or a 400-amp gasoline-driven welding generator. These mobile maintenance units are themselves given maintenance treatment during the night hours so that they are always in first-class condition to do their jobs. And every 18 months the welders are sent to the electrical shop for a complete overhaul.

The only gas cutting paper of the convention was delivered by F. C. Saacke, of Air Reduction Co., Inc. Mr. Saacke did a swell job of investigating what happens to the edges of armorplate after flame-cutting. He took hardness readings at the top, middle and bottom of all cuts in an effort to establish the hardness pattern near the cut edges. Immediately adjacent to the cut was a zone of fused metal having a very high hardness—up to 800 Vickers. Next to this was a heat-affected zone of lower but appreciable hardness and then a zone of softened base metal. Mr. Saacke found that varying the fuel gas made no difference to the hardness pattern, but variations in the cutting speed usually affected the depth of hardness. The higher hardness of the fusion zone he attributed to greater amounts of nickel and chromium.

Inert-Arc Research

Someone once defined a specialist as one who knows more and more about less and less. Judging by that definition, inert-arc welding has reached the hands of the specialists,

Fun and good fellowship . . .

GLASS CLINKERS include K. W. Ostrom (left), the man in charge of the annual dinner, and R. A. Guenzel, chairman of Philadelphia Convention Committee. We are sorry, but we do not know the ladies

THE THREE happy gentlemen are from Detroit. Left to right: Ray Stitt, Robert H. Bennewitz and Edward J. Del Vecchio

who are engaged in exhaustive studies of ever-narrowing fields.

One of the best of the inert-arc welding papers was that read by Donald Warren, of E. I. duPont de Nemours & Co., Inc. Mr. Warren and his colleague, R. D. Stout, of Lehigh University, undertook to find out the variables that are causing porosity in mild-steel welding. Using the inert-gas metal-arc process in conjunction with an airtight steel welding chamber, they investigated the effects of welding conditions, weld metal solidification rates, deoxidation level, welding atmosphere and surface contaminants upon the formation of gas cavities.

Each of the test welds (bead on plate type) was radiographed, and the porosity level was determined by counting the number of holes per inch of weld. If the holes were uncountable, the condition was referred to simply as gross porosity. Though many factors were found to affect porosity, the deoxidation level of the steel seemed to have the most influence. When a killed steel electrode was used on a killed steel base plate, the porosity level was from 1 to 6 holes per inch. A rimmed steel electrode on a rimmed base plate resulted in gross porosity. A neatly done piece of research with very practical applications!

J. Warden Cunningham and Harry C. Cook, both of Air Reduction Co., Inc., undertook to compare shielding gases, using photographs taken by the Schlieren optical apparatus and high-speed motion pictures. They found that the argon arc is entirely different from the helium arc, and a mixture of the two gases may be different from either. With the same current and polarity, helium and mixtures containing helium give higher rates of burn-off than argon. No measurable arc changes could be observed when less than 15% of either shielding gas was mixed with the other.

Another Air Reduction man, C. J. Sullivan, discussed the economics of welding mild and low-alloy steels by the inert-arc metal-arc process. Some interesting cost comparisons were made. A comparison of costs for one joint shows a total cost of $7.36 for inert-gas and $6.13 for conventional arc welding methods. Higher labor costs tend to make the inert-gas method cheaper than conventional welding. It is mostly a case of balancing the cost of the argon, about 8c per cubic foot, against the saving in labor that can be effected. In the joints previously referred to, the inert-arc joint was fabricated in less than half the time of the conventional welded joint and with less than half the electrode metal.

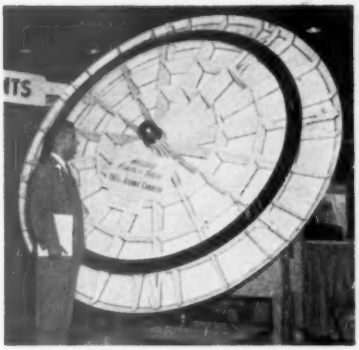
William L. Green and Robert J. Krieger, Ohio State University, used a stick feeder and a home-made welding head, under which the work moved inside a big shield. They took high-speed movies of the arc and found (contrary to the findings of another paper) that argon gives a higher burn-off rate than helium, but a 50-50 mixture of helium and argon makes little difference.

Brazing and Braze Welding

Brazing, bronze welding and soldering got a rather big play, with seven papers being delivered at two technical sessions. Dr. Robert Humphrey and René D. Wasserman, of Eutectic Welding Alloys Corp., approached brazing from the point-of-view of the physical metallurgist. Metallic bonding, they claim, is related to attractive forces between atoms and to the diffusion of atoms from brazing alloy into base metal.

Vacuum brazing, a technique developed by the Chicago Bridge & Iron Co., for clad plate, was discussed by R. C. Bertossa, plant metallurgist of this company. Large areas of plate can be brazed by this method, with tensile strengths for the brazed joints averaging from 40,000 to 60,000 psi. These "Hortonclad" composite plates can be produced with a clad layer of straight-chromium ferritic stainless steel, of martensitic stainless, of austenitic stainless or of nickel, Monel or Inconel. The use of Hastelloy as a cladding material is being investigated.

J. Raymond Wirt, Delco-Remy Division, General Motors Corp., talked on production brazing. He brought out the fact that there are eight brazing processes, using 33 filler metals, in the American Welding Society Handbook. As a specific example of the savings that may be



L. D. T. BERG, of Areway Equipment Co., strayed over to the Metal Show to view the welded base of the new atomic cannon

HOMER MORRISON (left), chairman of national Convention committee; Mrs. H. R. Morrison and R. H. Bennewitz, of Detroit Section of AWS. Both Morrison and Bennewitz are with the Linde Air Products Co.

effected by brazing, he cited the case of a casting that cost seven times as much as an assembly of silver-brazed components. Copper brazing in a controlled-atmosphere furnace is one very good method for high-production parts. The cost per part is low once the capital outlay for the equipment has been paid.

The single soldering paper was given by Robert M. MacIntosh, of Tin Research Institute, Inc. MacIntosh insisted that more soldering has been done in the last few years than ever before and that, moreover, the soldering process remains unchanged in its dependence on alloys based on tin and lead. Solder, however, is not a specific substance, but comprises a whole series of alloys, the properties of which vary considerably with the composition.

Resistance-Welding Papers

We'll take only samples from the ten papers presented on various phases of resistance welding. The first to appear on the program was the $250 prize-winning paper written by Messrs. B. Karnisky, E. H. Kinelski and E. P. Gruca, of Pullman-Standard, on the corrosion of structural spot welds. This paper is concerned with an investigation to: (1) gain basic knowledge on the corrosion occurring in outdoor exposure of spot-welded joints in low-alloy, high-strength steel and (2) to evaluate the beneficial effects of weld-through primers and sealers, both of which are applied to sheet metal prior to welding.

James F. Salatin and O. D. Etchison, both of Delco-Remy, discussed the maintenance of resistance welders in high-speed assembly lines. The problem becomes critical when production speeds higher than 1,000 parts per hour are involved. If only one welder goes out in a production line, 300 people have to stop work until it can be repaired. However, the program of planned maintenance and preparation for breakdown that was instituted over two years ago has prevented any serious loss of production. One method of minimizing trouble is a unitized system of design for mechanical parts and electronic controls. For instance, a plug-in system was devised that effectively makes the sequence timers in a given plant interchangeable. Any timer available will operate any resistance welder in the shop.

Myron Zucker told about a spot-and-projection welder that utilizes magnetic force produced by the welding current to provide tip pressure on the work. The force is adjustable in magnitude and is always perfectly synchronized with the welding current. Developed for a specific job of welding metals of high conductivity, such as copper and silver, this machine shows promise of giving better welds in other metals. It has been tried out, both in the laboratory and on production welding, on copper, silver, brass, tungsten, aluminum and steel.

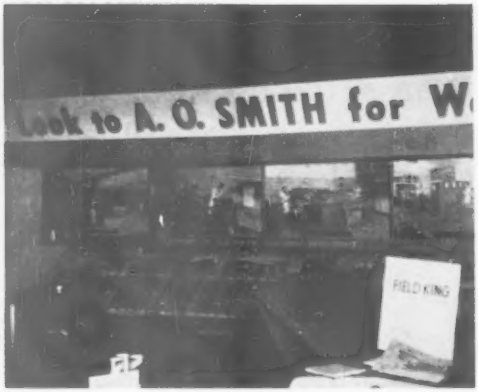
Probably the most controversial of the resistance-welding papers was the one on contact resistance, given by William B. Kouwenhoven, dean of engineering and professor of electrical engineering at The Johns Hopkins University. Some people to whom your reporter talked were of the opinion that this was a valueless piece of research, while others held that Kouwenhoven and his research associate, Clarence W. Little, Jr., of Allis-Chalmers Mfg. Co., were on the verge of an epoch-making discovery in fundamental theory. Time will tell which is right. There is no use saying more, because this paper simply cannot be summarized in a few words.

Equations for Spot Welds

Another paper on which opinion was divided was the one by Julius Heuschkel, of Westinghouse Electric Corp. Taking observed values for shear strengths and other test properties of spot welds, Heuschkel derived an impressive series of equations. He contends that these empirical equations permit the direct conveyance of a large amount of test experience in a terse form. As an example, the most useful spot-weld property, strength under tension-shear loading, was shown to be a function of five essentially independent variables: sheet thickness, tensile strength, carbon and manganese contents and weld nugget diameter. The presented equations apply only to carbon-manganese steels and to con-

(Continued on page 72)

TUNNEL of magic contained fluorescent-coated weldments, which were activated by ultraviolet rays. The welds glowed in different colors from the parent metal



WHAT goes on in a research laboratory was told on an endless belt of film running below the pictures. The film was translucent and was illuminated from behind

Metal Show in Pictures

Very latest welding methods and the big titanium displays captured the limelight at National Metal Exposition. Four big halls of exhibits took hours to see.

BY W. C. HENZLIK

RESISTANCE welding was well represented by exhibits

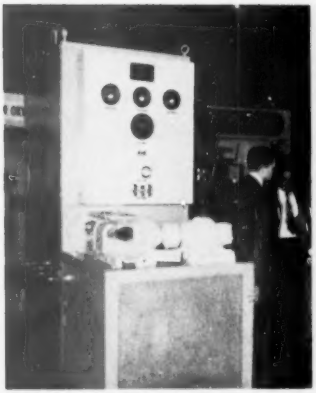
Most talked about metal at the Metal Show was titanium. Numerous displays at the 34th Metal Show in Philadelphia Oct. 20-24, had samples of the wonder metal on display with information on welding or forming it. One manufacturer had samples of strip, bar and fabricated parts. He was also running automatic inert-gas welding demonstrations on titanium. Included in the latter exhibit was one of the most valuable single items at the show, a $12,000 roll of titanium sheet. This metal also figured prominently at the AWS technical sessions, where it was discussed in six papers as well as in the annual Adams lecture.

The record number of more than 360 exhibits was housed in four large halls: Philadelphia's Commercial Museum, Arena, Exhibition Hall and Center building. Scattered widely throughout the four halls were some 75 welding equipment displays. The latter were as large as any in the show and certainly drew the biggest crowds of all. Their exhibits were lively and full of useful information.

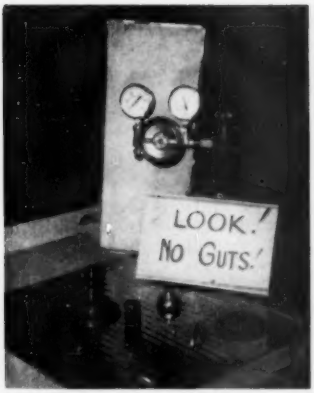
Decorations for the four halls included crystalline lattice-work structures hung from the ceiling and placed at focal traffic points. Ringing each hall above the booths were giant-size photo prints that related the complete history of aircraft from the Lilienthal gliders to the 700 mph eight-jet-engined XB-52 intercontinental bomber of today.

Serving both as a welcome and a welcome mat, hundreds of yards of red carpet covered every aisle in the four halls. This shock-absorbent underfooting consisted of red wool and mohair fibres mounted on a sponge rubber base. Considering the amount of walking and standing necessary to see the hundreds of products and machines on display, many people must have blessed the enterprising fellow who suggested this bright floor covering.

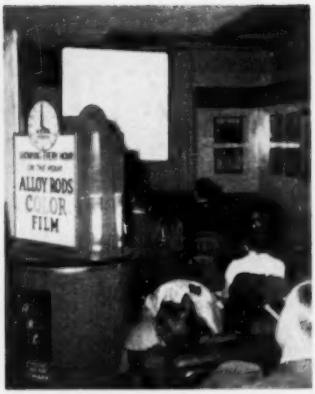
Perhaps the most unusual single exhibit of the show for welding men was a plant producing oxygen right on the floor. Including air compressor, purifier, separator and oxygen compressor, this plant was dressed up in an attractive paint job. Its source for 99% pure oxygen was the smoky and fume-laden air of the exhibition halls. Because of fire laws, cylinders couldn't be filled in the booth, but the plant did serve two oxyacetylene welding torches and four oxygen breathing masks. Your reporter observed many a somewhat jaded countenance brighten after a visitor whiffed at one of these masks. As an extra service, some of the hospitality rooms at the hotels downtown could have used one of these



SMOKE-FILLED air of the hall was transformed into purest oxygen by this portable, working plant



STRIPPED of everything but its seat, this regulator still stood up under a pressure of 2,000 psi



TRIP to electrode maker's plant could be enjoyed hourly by means of a recently produced color film

ARC welding is typified by submerged-arc demonstration

GAS welding and cutting displays were also prominent

oxygen masks on those depressed "mornings after."

Also attracting welding men's attention were the following new products: an automatic inert-gas hardfacing process, a new twin-electrode submerged-arc welding head, a new dye-penetrant for showing up hairline cracks and a new arc-oxygen torch.

Startling to the oldtime gas weldor was a regulator displayed in one booth with the sign, "Look, No Guts!" This was literally true since the regulator was virtually disassembled, but kept an oxygen cylinder's 2,000 psi pressure at bay for an entire week. Purpose of the display, of course, was to show good seat design.

Notable in many booths were movie screens and projectors for graphic explanations of manufacturing processes or product behavior in the field. One excellent 22-minute, sound-color movie (see picture at top right of this page) depicted electrode production from coiled wire stage through metallurgical analysis, cutting, coating, baking, marking, packaging and shipping.

For the men who felt lucky at the show, there were plenty of prizes to win. Among several noted in a quick check: a portable radio, pen-and-pencil sets, beryllium-copper fishing rods, watches and various types of souvenirs. Some didn't require a chance—remember the girl in the white bathing suit who was handing out rubber dollar bills?

For weary passers-by one booth simply operated eight comfortable chairs. Suppliers of this much needed service were 13 welding distributors from the Philadelphia area. According to booth renters Carl Berner and R. S. McCracken, Jr., it is a good idea to point out to many Metal Show visitors that the distributor has a vital role in the flow of equipment to the weldor.

Estimated attendance at this biggest of Metal Shows was 65,000, according to a closing day estimate. This included several thousand engineering students from the Philadelphia area and a good many wives who accompanied husbands on the trip east.

Among other visitors to the show was Benjamin Franklin, of Philadelphia circa 1775. The writer had a chat with old Ben, who observed that the Quaker City had changed considerably since his day. He also thought that electricity had really gone places since he drew it from the clouds with his kite. We wanted to get Ben's picture, but when we went back with our camera, he had disappeared. Did we see him, or didn't we? We are beginning to wonder.

New Atomic Secrets Will Be Revealed

To speed up the study of high-energy physics, scientists and engineers at Brookhaven National Laboratory have teamed up to build a two-billion-volt atom smasher.

1—COSMOTRON ready for service at Brookhaven. The giant circular magnet contains 288 plate-blocks

SUBATOMIC particles with energies of two billion electron volts or more will be used by scientists at Brookhaven National Laboratory, Upton, Long Island, to score bull's-eyes on atomic nuclei. The machine that makes available atom-blasting particles of this unprecedented energy level is known as the cosmotron.

Previous atom smashers such as the cyclotron have succeeded in reaching energies of several hundred million electron volts. This is not enough to penetrate the atom's ultimate secrets. Then why not increase the size of the cyclotron to provide the higher-energy particles that are needed? Sorry, say the scientists, but it isn't that simple. The cyclotron uses a magnet with solid pole faces. Where energies of a billion volts or more are involved, the size of the solid magnet required would be so great that its cost would become prohibitive.

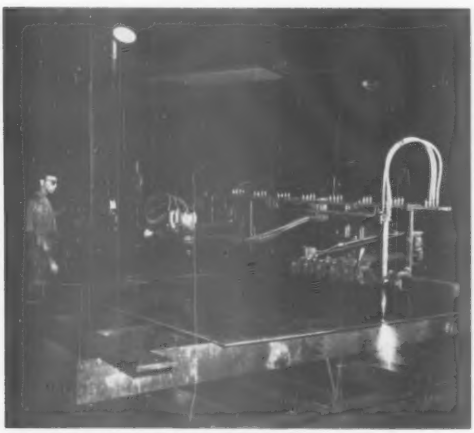
The Brookhaven cosmotron avoids this difficulty by employing a magnet built like a ring (popularly referred to as the "doughnut"), in which the bombarding particles move in a constant circular orbit. The magnetic field is increased as the particles gain speed until they are going around the periphery of the 75-ft-diameter magnet at a rate of about 3,000,000 times every second. The final speed closely approaches the forever unobtainable velocity of light.

Traveling at this unthinkable speed, the bombarding particles (hydrogen) can reach an energy level of two to three billion electron volts. Upon hitting their targets, they create new particles known as mesons. This opens up a very important field of research as the mesons are believed to be responsible for holding the nucleus of the atom together.

CONSTRUCTION OF MAGNET

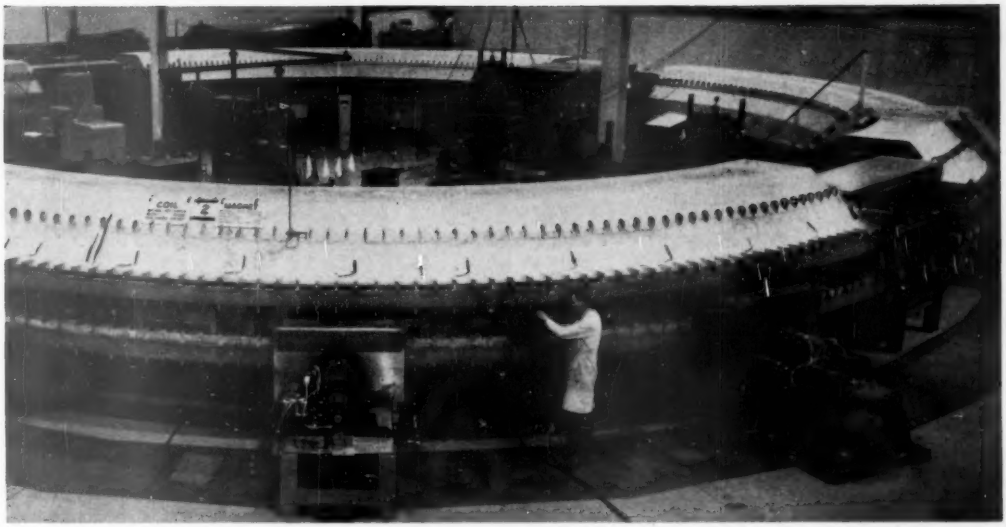
The magnet of the Brookhaven cosmotron, the most important component of the machine, was fabricated by Bethlehem Steel Co. at the Bethlehem, Pa., plant. The erection was also handled by Bethlehem engineers.

The magnet is a circular assembly of 288 octagonal blocks, arranged in four quadrants, as shown in Fig. 1. A quadrant consists of 72 blocks, each made up of twelve octagonal plates. Plates measure 94 in. between parallel sides. A slot, approximately 9⅜ by 48 in., is cut in each plate, and the plates are so arranged that the slots form a continuous pole gap around the outer periphery of the quadrants. The pole gap carries the magnetizing coils and the circular vacuum cham-



2—OCTAGONAL plate is flame-cut to the proper shape

3—PLATE is ground along the edges to remove burrs



ber through which the bombarding particles travel.

The plates used in the construction of the blocks were rolled at Bethlehem's Sparrows Point, Md., plant and delivered in sizes of 96 by 193 in., each sufficient for two octagonal members. The thickness was ½ in., and the required tolerances were +0.01 and —0.02 in., with preference on the minus side.

First the plates were flame-cut to shape and to approximate dimensions (Fig. 2). They were ground along all edges to remove burrs (Fig. 3). Then eight stainless-steel attachments were welded to one end plate in each block to provide bases for the coil supports.

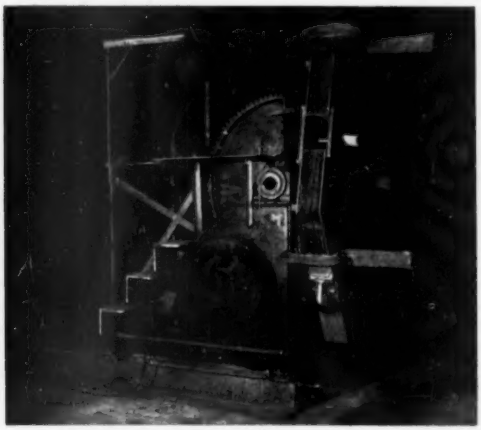
At this stage, it was necessary to stress relieve the plates. This was done in a car-bottom furnace while heavy weights were resting on top of each stack of plates to maintain flatness. Following stress relieving, the faces and edges of the plates were disc ground to remove any scale formed during the heating.

In effect, the assembled blocks act as a transformer core. To minimize the losses due to eddy currents, insulation was provided between each plate. The insulating unit is a sandwich of two sheets of insulating fibre, each 0.006 in. thick, between which is a sheet of aluminum foil, 0.0005 in. thick. The aluminum foil was made with tabs extending beyond the edge of the plates at two points. By this method it was possible to check for "shorts" between plates with an ohmmeter connected between plate and foil. The testing method is pictured in Fig. 4.

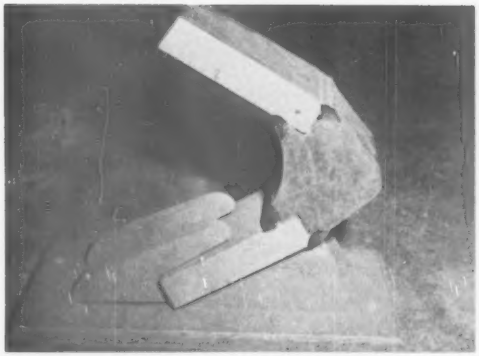
As the plates were being assembled, each face was first carefully cleaned with an organic solvent to remove all foreign materials. It was then checked for burrs and sprayed with resinous coating to hold the insulation while the next plate was being placed.

(Continued on page 64)

4—ASSEMBLED block of plates is tested for shorts



5—BLOCK of 12 plates is ready for welding (see cover)



1—CUTAWAY section of tank joint shows poor fit-up and very little chamfer. Penetration is not very deep

2—HINGE on rear section gives visual evidence of very poor welding technique and an unskilled operator

3—NOT A LUNAR photograph, merely uneven welds and high spatter at spot where bracket once fastened

4—CRACK in bell housing is the result of welding high-silicon steel without postweld stress relieving

Welding Is Crude

On the other hand, the T-34 and T-34/85 stand up in combat and do their job. Moreover, the Russians are turning them out fast. Are our own tanks overwelded?

BY H. C. PHELPS

TO COMPARE the welding on the Russian T-34 and T-34/85 military tanks with our own welding standards of tank construction would be like comparing a section gang bunk car with accommodations in a Pullman drawing room. The T-34 was designed with one idea in mind—to provide fire power. Any humanitarian considerations like protection of the crew are purely secondary.

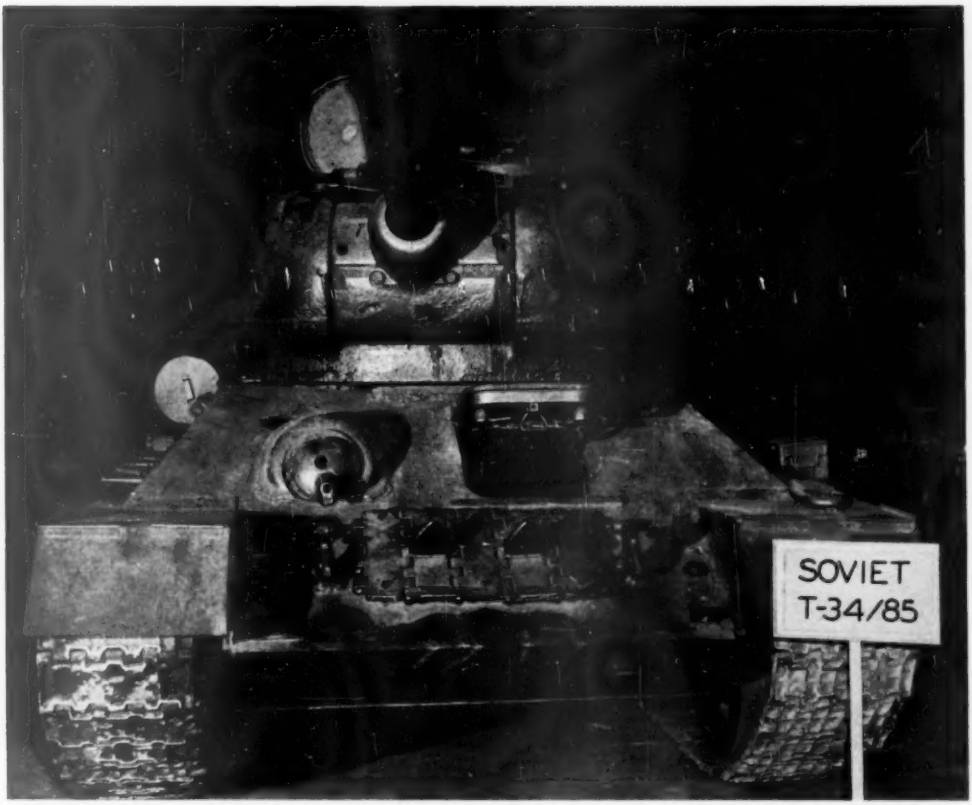
The designer's consideration has been given to the end use only. Every part, moving or stationary, is a compromise between materials, time and labor costs. Combat life is calculated at roughly 200 hours, an amazingly short life in comparison to our own vehicles. Treads, transmission, armor, engine, drive system and fire power are designed for this just short life expectancy and no longer.

You wouldn't think that Russian tanks would be much good. Yet the Germans found them superior to anything else they fought. German officers classified the Russian tank as the best in Europe. And the Germans, certainly, should be excellent judges of tank performance.

Then why is a poorly made tank good?

ARE WE OVERBUILDING?

One answer, which may or may not be true, is that we are overbuilding our tanks, throwing too much emphasis upon crew safety. Human life is cheap in Russia. and concussion-



CAPTURED Russian tank on exhibit at Aberdeen Proving Ground. It looks good—and it is! Despite many defects in welding and poor workmanship elsewhere, this tank will stand up and do the job it was designed to do

on Russian Tanks

racked bodies, crushed bones, and gore are taken as an indispensable part of the military picture.

They Are Expendable

The Russians build on the assumption that the one requirement is plenty of military combat resources. They say, in effect, that poor workmanship, ease of handling, comfort and safety of the crew will none of it have too much bearing on the final effectiveness of the equipment. If—and here's the whole point—they do have overall superior numbers of combat units that are expendable as necessary.

The safety of the crew has been sacrificed everywhere to enhance striking power and to cut production costs. The vital parts such as the transmission, engine (Diesel) and clutch are rough-finish engineering and workmanship, with a few exceptions. One exception is the crankshaft, which is a highly finished, hand-fitted craftsman-like job.

The T-34/85 tank, a later model than the T-34, has a lower silhouette than its older brother and a different turret design. It carries an 85-mm gun, can travel 30 miles per hour, and will climb a 60 in 100 grade. However, this 35-ton tank has to have four times its projected area to turn around.

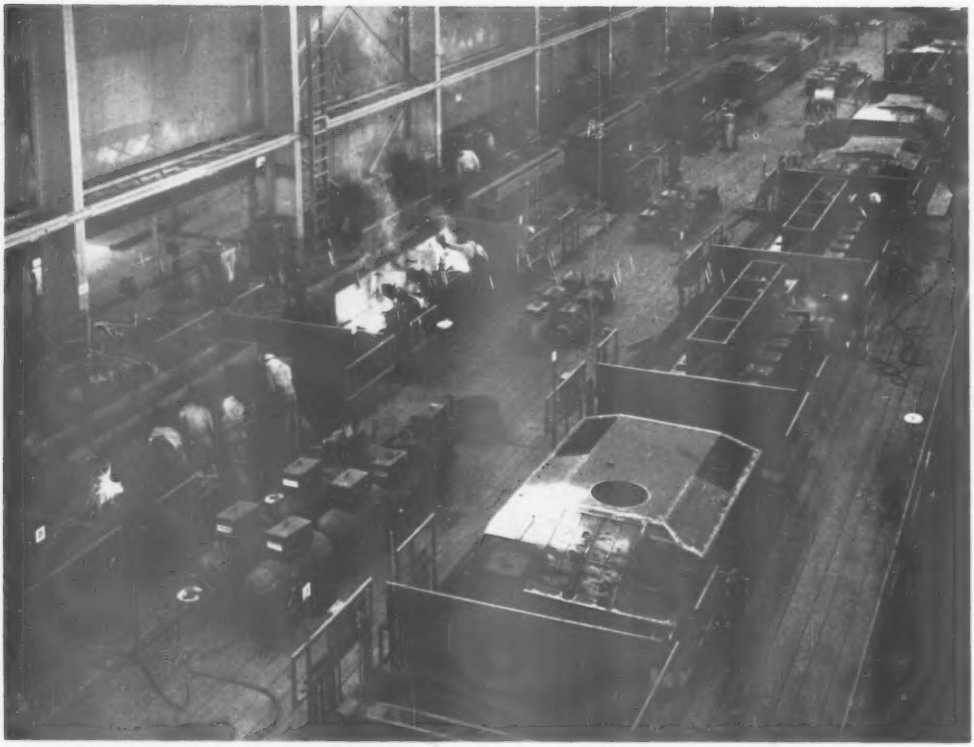
Workmanship Is Something

All castings are of rough finish and show poor molding practice. The engine-block casting looks like it was made from a poor mold and using impure or dirty aluminum.

Turret castings are of medium-carbon steel and quite dirty. They are usually 5 in. thick on the frontal area exposure, tapering on the sides and rear down to 3 in. Many of these castings show signs of having been welded at the factory, usually on the upper and lower corners in the after section.

Early models had rolled tops and

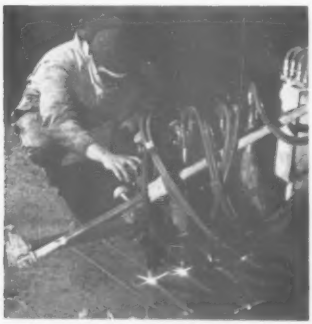
(Continued on page 64)



PRODUCTION lines for the fabrication and assembly of new Army personnel carrier. The two parallel lines are each capable of accommodating 18 fixtures, holding as many hulls. Note groups of welders at various stations

Sparks Fly as Armored

You've just read how the Russians' tanks are welded (pages 50 and 51). Now see how our own military vehicles are joined at the Consolidated Western Steel plant.

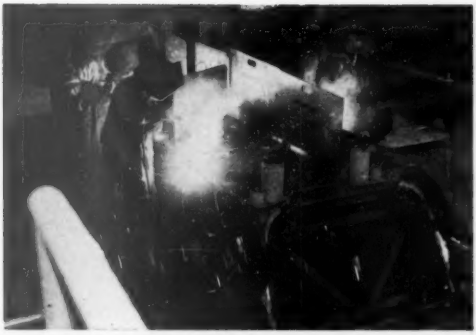


MAGNETIC tracer guides four torches for simultaneous cutting

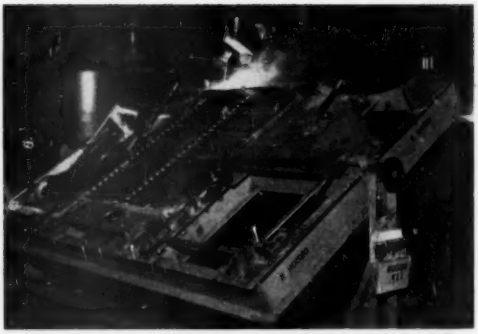
DUAL beveling of top and bottom edges is done in one operation

BERKELEY, Calif., plant of the Consolidated Western Steel Division of United States Steel is a busy place as flame-cutting operators, grinders and weldors fabricate armored hulls for the Army's new personnel carrier. Not exactly tanks but something very similar, the new vehicles are designed to carry infantrymen up to the front battle lines and protect them from shrapnel and small arms fire during the journey. The fully tracked armored carriers can reach speeds of 35 miles per hour on good roads.

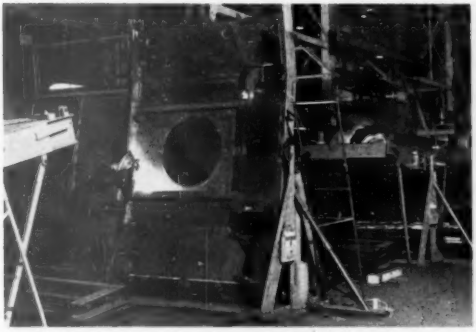
The Consolidated Western Steel Division has installed new and intricate production lines for fabricating and assembling the armored hulls. New bay-type buildings have been added to the Berkeley plant and approximately 800 employees, mostly skilled set-up men and weldors, have been



FIRST jig for subassembly. Upper and lower sides, bottom and sponson sections are combined—upside down



WELDOR is joining cast grill sections. The trunnion jig permits easy manual rotation for downhand welding



ROOF subassembly has eleven fabricated components. Weldor Benny Almojela can turn entire fixture by hand.

FINAL inspection before hull is shipped to prime contractor. Note track support arm castings at bottom

Bus Hulls Take Shape

added to the payroll. Army Ordnance inspectors are on hand to examine and approve the finished hulls, which are transferred to the prime contractor, Food Machinery and Chemical Corp., of San Jose, Calif., for completion.

Consolidated Western engineers designed the complicated fixtures and jigs. Government requirements made it mandatory that trunnion-type jigs be used throughout so all work could be turned for flat-position welding. All welding is hand welding, and each hull requires some three-quarters of a ton of stainless-steel electrodes.

Some basic parts of the hull are received at the plant in fabricated form as castings, etc. However, a majority of the hull's components are flame-cut, shaped and finished at the Berkeley plant. In general, pieces are first cut to shape and then subsequently beveled, although in some instances the operations are combined by a two-torch set-up. The pieces are generally cut out several at a time by multiple-torch shape-cutting machines, guided by magnetic tracers that follow metal templates of the desired outline.

Three Methods of Beveling

After being cut to shape, the largest pieces are beveled in specially shaped beveling tables, using portable cutting machines that run on special tracks. Both sides of a double bevel are cut simultaneously.

Medium-sized pieces are taken to two conveyor-type lines, incorporating both longitudinal and transverse cutting stations. Here the pieces are beveled as required on the various edges, one operation being performed at each station. The pieces then move by roller conveyor to the next station.

The very smallest pieces are clamped in groups on the moving platens of carriage-type cutting tables, and several pieces are beveled by the cutting tip in one pass. The pieces are then prepared for welding by a light hand grinding of the beveled surfaces and the plate face for a distance of one inch from the prepared edge.

The cut and beveled components are then moved on pallets by lift trucks and by small flat cars on rails to the next bay. Here, in conjunction with certain castings, they are welded together in a series of subassemblies. Because of the close tolerances required, the components and subassemblies are subjected to repeated

(Continued on page 62)

The base metal was cast iron.
The roll was 8 ft in diameter by 13 ft 8 in. long.
The walls were 2⅛ in. thick.
The weld metal had to be hard yet machinable.
It had to fill a crack 14 in. long.
It had to be capable of taking a high polish.
And a previous weld hadn't been successful.
How would you—

Repair This Yankee Drier Roll?

OUTSIDE of drier roll—the big roll in the background. Drier is part of a huge machine to make tissue paper

BY F. C. ZIMMER, *president F. C. Zimmer & Co., Inc., Brooklyn, N. Y.*

PICTURED above is a "Yankee" drier roll, a part of a huge machine that starts at one end with pulp and delivers finished tissue paper at the other end. As you might suspect from its name, the purpose of the drier is to dry the paper after it has been pressed from the pulp. To accomplish this, the roll is heated internally with steam. The steam heat evaporates the water from the wet paper as it traverses the roll.

Construction of the drier is fairly simple. There is an internal cast-iron cylinder, the face of which is provided with a number of grooves. The steam is supplied to these grooves and the condensate is removed while the drum is rotating at a fairly high speed. The volume of steam required is greatly reduced and the efficiency of the drier improved by fitting a cast-iron jacket tightly over the internal roll. It was this jacket which had developed a crack.

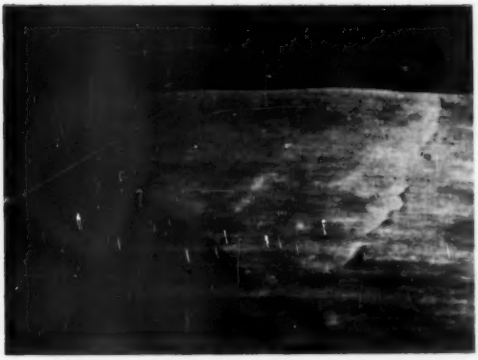
The repair of cracks in cast iron is always difficult, even when the castings are relatively small. In this case, however, the casting is a cylinder that measures 8 ft in diameter by 13 ft 8 in. long and has a wall 2⅛ in. thick.

How would you make this welded repair?

The first method tried was simple arc welding. Metal from an alloy electrode was fused at the base of the joint, and the surface was finished with steel electrodes. A wide area was overlaid with steel in an effort to secure a sound deposit for future finishing (the surface of the roll has to be highly polished in order to make paper). An attempt was made to "tie in" the crack by means of welds transverse to the crack.

This repair lasted about three weeks. When the second crack occurred, it followed generally the line of fusion and cracked completely through the transverse "tie in." The

1—CRACK in roll was prepared for braze welding by grinding out old metal deposited in a previous repair



2—AFTER finishing. The manganese-bronze patch (light area) matches the rest of the roll in hardness

new crack created was 14 in. long.

Ideally, the best repair for the shell would have been oxyacetylene or inert-arc welding using a cast iron filler rod. This, however, would have necessitated the jacket or sleeve to be preheated to 900-1,100 F, followed by slow cooling. Since such a cycle of heating and cooling causes cast iron "to grow," a complete remachining of the sleeve would have been required.

An economic analysis of the problem revealed that it would be cheaper to cast and machine a new sleeve. The difficulty was that the machine had to be maintained in production for a period of three months until the new sleeve could be cast and machined. It was necessary, therefore, to provide a repair that would seal off the steam leak and permit the drier to function.

The repair of the second crack (on which the writer was called in) was complicated by the presence of the first weld. The metal in the original weld was exceedingly hard. After a careful examination of the roll, the sleeve and the crack, it was decided to braze weld it by the oxyacetylene process using filler rods of manganese bronze. This repair might not permit the making of paper across the entire roll, but it would, at least, permit the machine to operate and the only lost production would be in the area of the repair.

The first step was to grind out all the metal of the first weld. Because of the hardness of the metal, this was extremely slow and laborious. It took 37 hours. After the original weld had been completely removed, the joint was prepared as pictured in Fig. 1. Then the outer shell was given a low value preheat, to about 180 F, by admitting steam to the roller. The low preheat was advantageous in attaining the overall expansion of the part and in helping to minimize the effect of the higher heat needed.

Before the actual braze welding began, the temperature of the prepared joint area was raised to about 700 F by local heating. The oxyacetylene torch then brought the joint to proper temperature for braze welding with manganese-bronze rods. Manganese bronze was selected for the filler metal on this job because it would provide a reasonably hard deposit, approximating that of the surface of the original roll.

To faciliate tinning of the bronze rods on the cast iron, a flux was used throughout. The actual time for braze welding required 18 hours. When the joint had been completely filled, the roll was permitted to cool down slowly while the braze-welded area was protected from drafts by a covering of asbestos paper.

After the roll had cooled down, the surface of the braze weld was ground down to the original roll dimensions and given a polish finish to permit the unit to operate properly. How the braze weld looked after finishing may be seen in Fig. 2.

When the unit was placed in operation, the braze-welded repair was completely tight. However, a minor steam leak developed in the packing at the edge of the roll, and it was necessary to limit production of paper until the packing in that zone could be readjusted. When this was done, it was found that the repair was even better than had been anticipated. It proved possible to make paper on the entire width of the roll at the designed speed of the machine—1,250 feet per minute.

The successful braze welding of this cast-iron job and the successful performance of the repaired roll are attributable to a number of factors. First was the employment of the low preheat (through the use of steam) to minimize the chances for crack propagation. Without this general heating, a locally applied heat could have caused further cracking in the roll. Secondly, braze welding avoided the high temperatures that would have been created if welding had been performed with cast-iron filler metal. This also lessened the chances of cracking. Finally, the manganese-bronze rods provided a weld deposit having a hardness matching that of the roll surface. This enabled the "doctor blade" to traverse the repaired area without gouging it and made papermaking possible.

Since the second repair, paper has been made for two months across the entire width of the roll at the design speed. This is certainly evidence that the braze-welding deposit is standing up.

* * *

We were assisted in our survey of this job by A. N. Kugler, mechanical engineer, technical sales department of the Air Reduction Sales Co., Inc. The job was covered by insurance under the Mutual Boiler & Machinery Insurance Co., of Boston, Mass., whose engineers Messrs. Canavan and Rendell stayed with our men throughout the entire job.

SAVED: 341

Welding will produce a better structure than either riveting or bolting, at a substantial saving in cost, and give other benefits as an added bonus. This was proved beyond a doubt in a recent building for the Veterans' Administration Hospital in Minneapolis.

The general construction contract for this ten-story tier-type building was awarded to the J. D. Hedin Construction Co., Washington, D. C. Subcontract for the fabrication and erection of the steel went to the American Bridge Co. The firm of Saylor and Greeves, Inc., Detroit, redesigned the building for a welded framework—original design by the VA Construction Service had been for a fully riveted structural steel framework. Inasmuch as Saxe erection clips and seats were used to secure the steel in place prior to welding, Van Rensselaer P. Saxe, of Baltimore, was retained as a consultant.

In the September issue, Col. Phelps told how the steel was shop fabricated prior to welding and gave tables proving that welding effected a total saving in steel of 341.0 tons. The second installment, published in November, described the erection procedures, including field welding, preheating, etc. The facts and figures on the various savings effected appear in this final installment—The Editors.

IN the Minneapolis hospital building for the Veterans' Administration, the weight of the electrodes issued per day gave a fairly accurate means of comparing the production of individual weldors. An ordinary balance scale was used to weigh out the rod as issued to the weldors. All returned rod was also weighed.

Column two of Table I gives the number of rods (14-in. length) per lb of electrode for 5/32, 3/16 and ¼ in. sizes. The third column gives the weight of each of these rods in lb. Burn-off rates in lb per hr for the three electrode sizes are compared in column four.

Column five of this table requires a word of explanation. Stub loss amounts to 10% of the weight of the rod, spatter loss 25%. Total wastage therefore is 35%. If we take 135% as the base and divide each of the figures in column 3 by this base, we obtain the figures given in column five—the number of pounds of effective weld received from each rod.

Table I. Rod Weights and Effective Lb of Weld

(1) Electrode Diameter, In.	(2) Rods per Lb	(3) Lb per Rod	(4) Burn-off rate, Lb per Hr	(5) Lb of weld per rod, (Col. 3 ÷ 1.35)
5/32	12.2	0.082	3.3	0.06
3/16	8.2	0.122	4.28	0.09
¼	4.6	0.218	7.5	0.16

Table II. Lineal Feet of Effective Weld per Rod

Electrode Diameter, In.	Size of Fillet Weld, In.					
	⅛	3/16	¼	5/16	⅜	½
5/32	0.75	0.40	0.24	0.17	0.12	0.07
3/16	1.12	0.60	0.36	0.25	0.18	0.11
¼	2.00	1.17	0.64	0.44	0.32	0.19

THIS MONTH

Colonel Phelps presents a detailed cost sheet of the savings welded construction effected over riveting.

Table III. Field Welding Costs

Welding labor	$32,350.00
Tons of steel welded	1,980.00
Labor per ton	$ 16.34
Days of welding	103
Cost per welding day	$ 314.00
Avge. number of weldors	13
Cost per weldor-day	$ 24.15

Table IV. Daily Production Estimates

(1) Total lb of electrodes used	14,025
(2) Total weldor days (103 x 13)	1,339
(3) Lb of electrodes per weldor-day	10.48
(4) Average weld placed	5/16-in. fillet
(5) Lb per foot of 5/16-in. fillet weld	0.36
(6) Wastage factor	1.35
(7) Lineal feet of effective weld per weldor-day	21.56

Note: Row (7) = 10.48 ÷ (1.35 × 0.36)

Similarly, the number of lineal feet of effective weld per rod for a continuous fillet weld is given in Table II. The same three electrode sizes are compared for various sizes of fillet welds in this table. Weights of standard fillet welds, in lb per foot of continuous weld, are:

⅛ in. ..... 0.08 lb per ft
3/16 in. ..... 0.15 lb per ft
¼ in. ..... 0.25 lb per ft
5/16 in. ..... 0.36 lb per ft
⅜ in. ..... 0.50 lb per ft
½ in. ..... 0.83 lb per ft

The size of electrode that can be used is determined by the position of the weld. A 3/16-in. rod is the maximum size to use on a vertical fillet.

* * *

To effect the saving in weight of steel beams possible with continuity design, it is necessary to assure that stresses can be transferred from beam to beam through the column connections without deformation of the column. The following formula was used to determine the maximum size of beam which could be membered into a column without adding reinforcing to the column.

$$F = \text{or} < \frac{3WC}{4}$$

$$Fd = \text{or} < \frac{Dt}{2}$$

Where

F = Width of beam flange
WC = Width of column flange
d = Beam flange thickness
D = Depth of column
t = Thickness of column web

Tons of Steel—III

BY COL. R. A. PHELPS

Table V. Resumé of Savings Made by Welding

Savings in steel			
Saving in auxiliary steel		234 tons	
Saving in weight of steel beams		107 tons	
Total saving		341 tons	
Savings in structural steel			
Riveted: all steel except rivets		2,242 tons	
Welded: all steel except Saxe clips and electrodes		1,968 tons	
Saving		274 tons	12.2%
Saving in cost of joints			
Rivets: 75 tons @ $220 per ton	$16,500		
Clips: 9.33 tons @ $800 per ton		$ 7,464	
Electrodes: 11 tons @ $260 per ton		$ 2,860	
Totals	$16,500	$10,324	
Saving		$ 6,176	37.4%
Transportation			
Weight of riveted steel handled plus rivets		2,317 tons	
Weight of welded steel handled plus clips and electrodes		1,988.33 tons	
Saving		328.67 tons	14.2%
Fabrication			
Saving in fabrication labor costs			15.0%
Unloading, sorting and delivery to job			
Saving directly proportional to weight handled through yard			12.2%
Erection			
Less weight of steel raised, less plumbing and no temporary bolting			10.0%
Welding labor			
Saving over riveting			14.0%

A complete table based on the above formulas was developed. It contained all sizes of columns and beams used on this job. Where beams larger than the maximum allowed by this table were used, reinforcing in the form of stiffener plates was placed between the flanges of the columns. Figure 3 shows the location of stiffener plates, and Fig. 2 (photograph) these plates in position.

Stiffeners in the form of cover plates placed across the connection on the top and bottom flanges were used: (1) where spandrel beams membered into the flange of the column and (2) where two intermediate beams membered into a floor beam. Column caps were also used at the top of the columns to stiffen the column flanges.

As stated before, no details of this auxiliary steel were available when the main members were fabricated. In fact, the steel was entirely erected and most of the welding completed before these auxiliaries were received. It was necessary, therefore, to weld them in the field, and a complete trip over the framework was required to do this. Most of this work could have been performed by the fabricating shop at one-third of the cost.

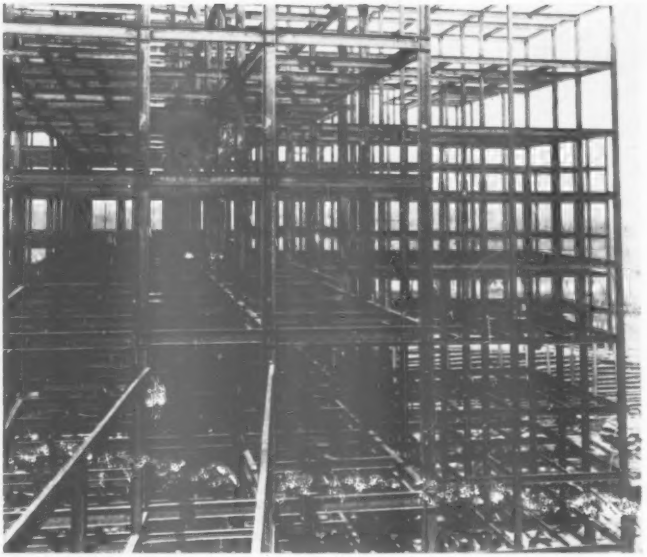
The erectors were able to place the steel much more rapidly than the welding could be done. As the erection could not proceed more than two floors ahead of the welding, it was necessary to skip floors. That is, the top floor of each tier and the column splices were welded. A second trip over the entire framework was required to weld the intermediate floors. This also increased the cost.

Welding vs. Weather

Newcomers in this northern area are surprised to find that weather is even more of a topic of conversation here than elsewhere. They soon learn that this is because the weather influences the lives and actions of the people living in the Twin Cities to such a great extent. Cold weather was the greatest handicap to the welding work on this building.

The first weld was made on October 17 and the last weld was made on April 4. The total lapsed time was 170 days, which coincided almost exactly with the winter season. The winter was one of the most severe ever

1—EXTREMELY cold weather made heavy winter clothing a necessity



2—STEEL framework erected, showing the column stiffener plates in place. Compare this photograph with drawings of Fig. 3 on opposite page

experienced in an area where severe winters are normal.

Even before the welding crew had been fully recruited and organized, the winter set in on November 9. From that date on until the end of the work, the temperature was below 32 F, making preheating necessary as explained in Part II (November, 1952, THE WELDING ENGINEER). No work could be performed on 29 of the normal working days. On 13 of these days the temperature was below zero, and on 16 days snow, ice and wind of blizzard proportions made it impossible to work on the steel.

On 19 of the 103 days on which work was done, snowstorms occurred. On these working days, there were times when the snow blanketed the building so completely that weldors could be located only by the blue flash of their arcs. On the majority of the winter working days, the temperature ranged between 0 and 10 F above, and icy winds blew almost continually.

When the steel was coated with ice, movement on the framework was very dangerous. Weldors, huddled on small floats where it was impossible to maintain blood circulation by movement, had to wear very heavy, cumbersome clothing to withstand the cold (Fig. 1). This made their movements very slow and precarious and so retarded the speed of the work.

Though the cold weather certainly interfered with welding, it is the writer's belief that it had a beneficial effect on the structure as a whole. At the time the welds were placed, the steel members were shortened the maximum amount possible by low temperatures. Therefore any stresses placed on the welds at any subsequent time by temperature changes due to normal causes will be compression stresses. The welds will never be under tension.

CHECKING THE WELDS

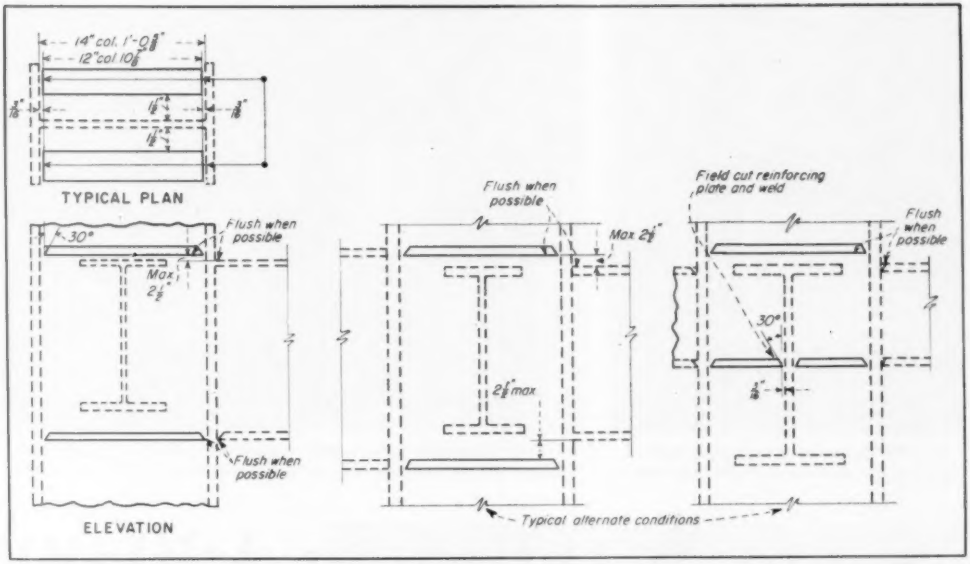
In spite of all handicaps, the work continued without a serious accident and a high quality of workmanship was maintained. Just prior to completion of the welding, a reinspection was made to check all points subjected to the greatest strain. No indication of any cracking in the welds was found.

The testing laboratory made a certificate to the fact that the welding on all the structure was performed in conformance with the approved drawings and in accordance with the best accepted practices of the American Welding Society and the American Institute of Steel Construction. Later, when the forms were being installed for the concrete fireproofing, each weld was again carefully examined. No defects were found in the entire structure.

An even more severe test was later given to the welded framework when the Twin Cities experienced their most severe wind storm of record. Wind velocities up to 135 miles per hour were recorded at the Wold-Chamberlain Airport, located less than one-half mile from this building. Many houses were demolished throughout the cities, and thousands of large trees were uprooted.

At the time of the storm, the steel framework had been completed and welded, but the concrete floor slabs and fire proofing were finished only on the lower three floors. Brickwork had been started on the first floor. A hanging scaffold supported from steel outriggers located above the top floor was in place on all sides of the structure. The supporting cables were played out their entire length, and the heavy scaffold was loaded with brick for the next day's work.

The wind swept through the steelwork, tearing off concrete forms and whipping the scaffold like a flag. Steel outriggers were twisted in all directions, indicating the severe racking the building had received. How-



3—PLAN and elevation drawings showing the locations in which stiffener plates for the columns were placed

ever, a very close inspection could discern no movement in the welded steel. The building remained plumb and not a weld was cracked.

Costs of Field Welding

Table III summarizes the field welding costs. The weldors received $18.20 for eight hours of straight time. The balance of the $24.15 cost per weldor-day was due to double time paid on 12 Saturdays and to the cost of the operating engineer for the welding machines and also the welding foreman.

Daily production estimates are given in Table IV. The figure in row seven for the number of lineal feet of effective weld per weldor-day was obtained by dividing the 10.48 lb of electrodes consumed per weldor-day by the 0.36-lb weight per foot of 5/16-in. fillet weld and dividing the quotient again by the wastage factor of 1.35. This gives 21.56 lineal feet of effective weld per weldor-day.

Weldors averaged two 4-beam-to-column connections plus one intermediate beam a day (14WF 34 beam). The weld length of the beam-to-column connection was 2.5 ft. For the two 4-beam-to-column connections, therefore, the amount of welding is 2.5 x 4 x 2 or 20.0 ft. The one intermediate beam represents 2.0 ft. Adding these two figures gives us 22.0 lineal ft of effective weld per weldor-day, a figure that is only slightly different from the 21.56 ft obtained in the manner explained.

It is reasonable to assume that without preheating and under favorable working conditions, this daily average would be 30 to 35 lineal feet.

Welding vs. Riveting

For the 14WF 34 beam-to-column connection, the 2.5 lineal feet of 5/16-in. fillet weld has a cross-sectional area equivalent to 9.9 rivets of ⅞-in. diameter. This comparison is based on an allowable stress in shear of 13,600 psi for the fillet welds and stress in shear of 15,000 psi for the rivets. The average daily production per weldor of 21.56 lineal feet of 5/16-in. fillet weld (see Table IV) is equivalent to 85.5 rivets of the same size.

The average daily production for a four-man riveting crew is 300 rivets or 75 rivets per man. Welding, therefore, represents an increased production per man of 10.5 rivets, or 14% greater production by weldors. Under more normal conditions, we believe that this should be 20% greater.

Table V gives a resumé of the savings that were effected by the use of welded construction. The savings in auxiliary steel and in the weight of steel beams totaled 341 tons, as explained in part one of this article (page 23, September, The Welding Engineer). The saving in structural steel was 274 tons or 12.4%.

Other Savings

Structural steel erected with Saxe clips and welded has square corners at all beam connections. There are no protruding angles, plates nor braces. This simplifies the work of constructing forms for concrete fireproofing, which materiallly reduces the cost of this work. Also these square corners in the finished building allow ceilings to be placed directly below the beams without the necessity of furring out the corners. This also reduces the cost of lathing and plastering, and the finished work is much more sightly.

As welding saves on the use of critical material, saves in the cost of both material and labor and provides a better structural steel-framed building, the welding engineer is promoting the best interests of his customer in every way when he recommends welds in lieu of rivets or bolts.

The End

1—INERT-ARC machines weld longitudinal seams when sections are assembled

2—EACH longitudinally welded section is pressure tested individually before the assembly is continued. Note taper of sections

Seam Welding at 120,000

Mammoth welders at Ryan Aeronautical Company make leakproof seams on the world's biggest fuel tanks for aircraft. Each tank packs a service-station full of fuel.

LARGEST external fuel tanks known to be in production are coming from assembly lines at Ryan Aeronautical Co., San Diego, Calif. With a record-breaking capacity for carrying kerosene or gasoline, these mammoth containers will bring increased range to combat aircraft.

Working to the prime contractor's specifications, Ryan engineers created a torpedolike structure that packs huge quantities of fuel. Cylindrically shaped, with tapered nose and tail domes, the fuel cells are aerodynamically smooth. More than 30,000 spot welds are used to join the strong aluminum-alloy sheets that form the lightweight tank.

These immense tanks have amazingly few components. No longitudinal members are used in the design and very few bulkheads. Ryan welds the longitudinal seams of the circular tank sections with automatic inert-arc welding machines (Fig. 1). These machines make fast clean welds that are no thicker than the sheet thickness and so can be overrun by seam-welding electrodes later on.

All circumferential joints are closed with two rows of spot welds and one row of seam welding to accomplish a gastight seam.

One of the largest projects attempted in the aircraft industry with spot-welded aluminum alloy, the big tank posed a number of perplexing problems for production. These were:

First, the size of the structure exceeded the dimensions of standard welding equipment.

Second, the alloy selected did not respond satisfactorily to commercial cleaning compounds, and an acceptable surface resistance was not being obtained for certified spot welding.

Third, the requirement that the huge containers had to be absolutely gastight by welding alone made exceptional cleaning and welding supervision a must.

Let us look at the solution of each of these problems in turn.

New Giant Welders

To handle the welding tasks, Ryan plant engineers ordered some of the largest and most versatile equipment of its type. Four pairs of towering machines for seam and spot welding were installed in the production area. Each of these big welders (Fig. 3) has a 60-in. throat depth and can handle the work 62 in. from the floor. It can deliver a current of as high as 120,000 amp between the rolled sheets, which are squeezed together with a force of 10,000 lb or more between the two electrode wheels (Fig. 4). These wheels can produce more than 200 roll spot welds per minute and cram nine welds into a running inch.

Trained two-man teams were placed on each machine: one to operate the machine and the other to control the feed of the work. Special equipment was needed to feed the work to the welding machines. The system which Ryan devised has proved its practicability. Tank sections are loaded on steel dollies by means of an overhead monorail system, using electric hoists. The dollies are rolled to the welding equipment on steel tracks, carefully located to feed into each machine. Rollers in the dollies cause the circular sections to rotate for welding. A hydraulic cylinder is installed in each dolly to swing the sections from one side to the other, at one end. This device is connected to the head con-

3—TANK SECTIONS are roll spot and seam welded together. The welder can deliver a current as high as 120,000 amperes for welding

4—FORCE between electrode wheels may exceed 10,000 lb. Throat is 60 in. deep

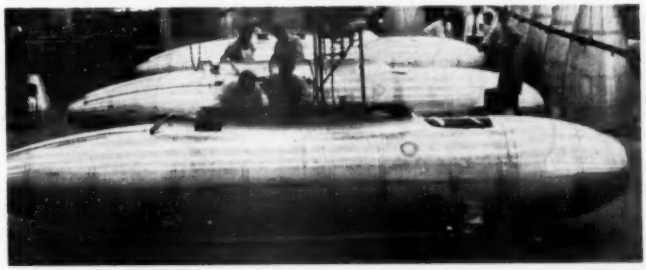
Amperes

trol, which is operated by one of the two-man team. It is possible to yaw the tapered sections as they are rotated and thus produce straight welded seams over the tapered surfaces.

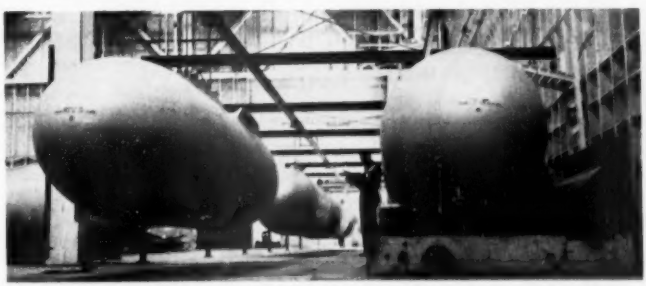
New Cleaning Agent

A high-strength aluminum alloy without cladding is used for the fuel tanks. This alloy also has a high ductility that makes it readily adaptable to resistance welding. It is difficult, however, to clean thoroughly. None of the compounds that were commercially available would clean it uniformly but produced a spotty removal of oxides. This is most detrimental to good spot welding because it is impossible to set the machines for consistent operation.

The Ryan development laboratory produced a new cleaning agent that removes all the oxides with smooth uniformity. Furthermore, the cleaned surfaces have a low surface resistance, which is maintained for fairly long periods. Daily charts of surface resistance show that a consistent figure running between 10 and 15 microhms is attained. This is well below the specified 50 microhm limit. The cleaning process is not critical as the same good results can be obtained with immersion periods varying as widely as two to twenty minutes.



5—STREAMLINED drop tanks receive a careful inspection *after* welding. Largest yet produced, each tank carries a record-breaking quantity of fuel



6—LIKE EERIE, ghostly zeppelins, the tanks hang from overhead conveyor system. They have just been sprayed with a surface-protective film

Making Tanks Leaktight

A major concern to Ryan production planners was the requirement that the big tank be made leaktight by welding alone. Unlike rivets, spot welds cannot be repaired or replaced if they are seriously defective. Also, their strength is critically keyed to the condition of the surfaces welded and to the behavior of the welding equipment. One grease spot, one tiny foreign particle, can cause welding

resistance and temperatures to zoom and produce an explosive melting of metal with a resultant hole in the sheet.

Inspection and Testing

No simple solution exists to this problem. Exacting care is taken to prepare the sheets and to govern the performance of the machines. All aluminum alloy is welded within 24 hours after cleaning. Test samples are taken hourly from the welding machines and subjected to a tensile pull test of 1,200 lb. Regular X-ray examinations are also made from sample spot-welded pieces to check the microstructure of the cast weld material. And each tank section is individually pressure tested with 3½ psi pressure to make sure that it is leakproof prior to seam welding. The testing is done in specially made jigs (Fig. 2).

After welding has been completed, the tanks receive a most careful inspection (Fig. 5). They are then prepared for delivery by spraying them with protective film to prevent scratches in shipment. In Figure 6, the tanks are shown hanging from the overhead conveyor system after spraying.

The result of the careful planning of this project from the engineering conception through all phases of production has been most gratifying. None of the large number of tanks produced has been rejected because of defective design or workmanship.

ARMORED BUS HULLS

(Continued from page 53)

straightening operations in powerful hydraulic press equipment. Press operations are exacting, and great skill and judgment are required because of the springiness of the armor plate.

Set-up crews place and align the various pieces or components of a subassembly in trunnion-mounted jigs for welding. Integral positioning stops and special clamps are used to hold the pieces in proper position and alignment. With properly sized pieces, the welding gaps are automatically correct. To obtain proper welded joints, wide welding gaps of at least 3/16 in. are required.

Copper bars shaped to the contour of the groove are used to back up the root and cover passes. Upon reversal of the jig, the back-up bar is removed and the root of the previous weld ground out to solid metal. The surface is then checked by a dye penetrant for cracks; if none are found, additional welding passes are laid.

The assembled tank is made of seven major subassemblies, each of which is in turn made up of further subassemblies and parts. These subassemblies are set up and welded in trunnion-mounted jigs of varying sizes, depending upon requirements. All jigs are so arranged that maximum exposure for back grinding will be obtained upon removal of the copper back-up bars.

Assembling the Hull

The first assembly operation for the hull puts together in an inverted position the previously subassembled bottom plate, upper and lower side plates and the sponson plates. As these pieces form the basic structure for the vehicle, alignment and positioning at this stage are especially important and considerable time is spent in securing a careful alignment of each hull. After alignment, the various joints are welded from the outside only. Rotation of this first-position jig is not required, so back-up bars are used to weld the seams.

After removal from the jig, the assembly is turned right-side up. The root pass is back flushed with a carbon arc and back ground. After dye checking the assembly for cracks, it is placed in a squaring and fit-up jig, where internal alignment supports are inserted. The remaining major subassemblies are fitted up and tack welded in this jig. After the attachment of copper back-up strips for all unwelded joints, the hull is then ready to go in the main welding line.

For the main welding line, the hulls are placed in second-position jigs. This jig consists of an electric-motor-driven, trunnion-mounted frame designed to afford maximum access to the weld joints. The frames and their rapidly growing hulls travel on cars, which are coupled together in two parallel lines moving in opposite directions. Crane transfers are made at each end so that the cars follow a repeating path. This line can handle 18 cars in progressive movement.

At regular intervals, all cars are moved forward one station. The crews remain at their respective stations to perform identical operations on successive hulls. Ventilator equipment is provided to remove gases and smoke from the hull interiors during interior welding operations.

At the end of the first or "going" line, the hulls are removed from the frame and placed in the third-position or "Endo" jig. Certain joints on the ends of the hull, which cannot be positioned properly in the line jigs, are welded at this stage.

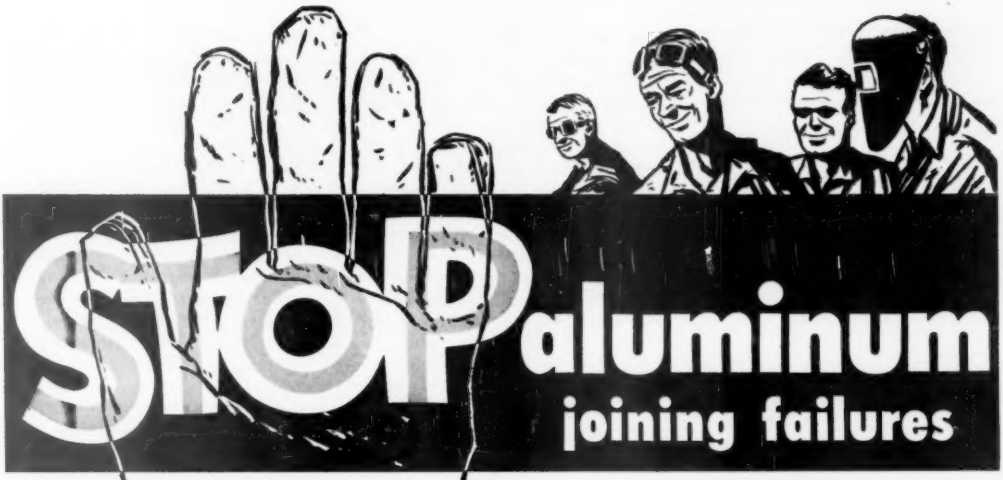
Next come the support arm housings. These are armor castings to support the hull track suspension. They are placed and properly aligned in the "Bogie" jig, preparatory to receiving the hull. Upon completion of welding in the Endo jig, a hull is carefully lowered over the aligned castings on the Bogie jig. When properly located, the castings are partially welded in place. Then the alignment plugs are withdrawn, and the hull is ready for insertion in the return portion of the main welding line.

During the return circuit, the castings are completely welded in place; certain door openings are cut to exact size; the internal alignment supports are removed; and preliminary clean-up and repair operations performed. The return line also has 18 stations. By the time the hull reaches the end of the second line, it is ready to go to the final inspection bay for radiographic examination and dimensional checks

Final Inspection

The hull is mounted in an electric-motor-driven trunnion fixture that permits maximum access to the welded joints for X-ray pictures. Pictures are taken at spot check locations designated by government inspectors, and any necessary repairs and repeat pictures are made in the same type of fixture. After radiographic acceptance, the hulls are carefully inspected visually. Dimensional tolerance checks are made of important components, principally door frame flatness, door opening size, side plate flatness and proper location and alignment of the support arm castings. The latter castings are checked at all locations simultaneously by means of a large multiple-plug checking jig.

The hulls are then shipped to the primary contractor for final machining and the assembly of power plant, tracks and accessories.



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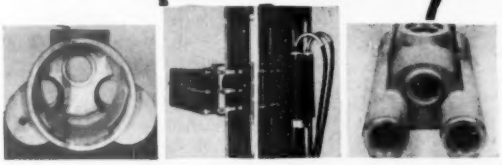

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"Our X-Ray tube housing is fabricated from eleven different parts that are assembled and welded. This assembly is then immersed in water and tested to withstand 50 lbs., air pressure to insure against leaks or porous welds. After the tube is joined, the inside of the housing is lined with lead to imprison the dangerous X-Rays.

An additional factor that makes this such a difficult metal-joining problem is the extremely wide temperature range to which the housing is subjected. The tube, ordinarily remaining at room temperature when not in use, rapidly attains a heat of 215°F. in operation, making the use of solder impractical.

Test after test of welding alloys in various price ranges had failed in one or another of the requirements. One of the chief causes of failure was the high heat at which conventional welding alloys are applied. This high heat either melted the delicate threading on the fittings or required extensive aftermachining and finishing before the crinkle finish could be applied to the completed piece.

Finally EutecRod 190, the new EUTECTIC Low Temperature WELDING ALLOY, was recommended and tested — and met *all* requirements! Expensive finishing was eliminated due to the unique thin-flowing characteristics of the alloys. Because of the low heat of application, the threads remained unharmed, rejects were eliminated, and production speed increased enormously. Tensile tests definitely proved that the strength of the joint was multiplied many times over—while the actual *cost per job decreased!*

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*—M-Laboratories, Connecticut**

*Full name and address on request.

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RUSSIAN TANKS

(Continued from page 51)

cast sides, which were welded together by discontinuous botchings—single, double and even triple pass. Some welds are cracked down the center of the bead and show no signs of being stress relieved.

Poor Fit-up Common

All armorplate is hand welded, and joints are frequently very poorly fitted together. No joint has a vee of the full depth we consider essential to sound welding practice. The cutaway section, Fig. 1, offers one example of poor fit-up with very little chamfer. In some instances gaps of 3/16 in. are visible. Primary armorplate, however, is welded with stainless-steel electrodes and the workmanship is of the highest quality. Superior welding can be done where the Russians deem it necessary.

Again, we may find a hinge or a bracket or strap hanger, maybe, that has the worst looking glob of droppings imaginable. The surrounding area will be covered with spatter, parent metal undercut and surface alloying so poor that many can be broken off with a quick tug by hand or applied pressure from the foot. Examples of poor welding on a hinge and on a bracket are provided by Figs. 2 and 3.

There is an extremely wide variance in welding quality. The bell housing, Fig. 4, shows poor welding (most apparently done in the field) coupled with a lack of stress relieving. The result is an enormous crack. Welds adjacent to the housing indicate poor penetration, spatter and lack of proper machine adjustment.

On the other hand, sector gears, used to raise and lower the gun, have welding far superior to any on the rest of the tank except the armorplate.

They Like Silicon Steel

Steering clutches on the transmissions have a riveted arm where a silver-brazed joint would be superior. Nowhere is there a sign of this kind of fabrication, nor is there any sign of braze welding. Apparently, the Russians do not know about these methods. Nor, so far, has any use of low-hydrogen electrodes been found. Possibly lack of this electrode has had some bearing on joint design.

One reason for poor weld quality may be found in the type of steel that is being used. Both plate and castings show a silicon content of nearly 2%. Any amount of silicon over 1% affects weldability adversely. Incipient cracks are encouraged and internal stresses created. Despite these formidable drawbacks, the Soviets have a fondness for high-silicon steel.

After Russia was recognized by the United States in 1933, negotiations were started for the purchase of several million tons of steel from the U. S. mills. Trouble soon developed over the analysis. The Russians insisted we furnish high-silicon steel, a type that we consider inferior to other steels. The mills didn't want to do it, but Ambassador Molotov thumped long and loud until he got what they wanted.

Armorplate analysis is usually:

1 to 2% silicon, added for hardness and as a deoxidizer.

1½% maganese, a non-magnetic hardener.

2 to 3% nickel, to give increased weldability and ductility.

10-12% chromium, for hardness and corrosion resistance.

0.40% molybdenum, adding hardness, increasing endurance limits and reducing temper embrittlement.

Brinell hardness is 330 average, which is equal to U. S. tank armor specifications. The hardness is, undoubtedly, helped by the ample quantities of nickel, chrome and molybdenum.

Armorplate is usually gaged by resistance to shell fire. The Russian armor will withstand a 3-in. shell against 3-in. plate, a standard test used by U. S. Army Ordnance.

Armor Thickness Varies

Rolled armorplate is 2 in. thick on the 30 deg sloping frontal area and 3 in. thick on the exposed sides. Joints are not chamfered enough to give any semblance of weld penetration. The deepest chamfer noted was not over ⅜ in. deep. Where design would permit, chamfering was done away with entirely or only one side was ground.

No signs of stress relieving or heat treatment can be found anywhere, and yet plate and castings are hard enough to withstand a high-velocity projectile. Bazookas, however, are in most instances effective against them.

Our own welding engineers will find it almost impossible to appreciate the cold, brutal realism of the T-34 tanks. They will shudder with horror at the poor design, sloppy workmanship and steel of inferior welding quality. The fact remains, however, that the T-34 gives a good account of itself in combat. It did in World War II, and it has been doing equally well in Korea.

Russia does not have enough skilled workers for all-around production, but she does have engineers who know how to supplement skilled with unskilled labor. That's a fact we will have to reckon with in gaging the Soviets' military potential.

NEW ATOMIC SECRETS

(Continued from page 49)

After thorough testing, the plates were permanently welded into the final block assemblies. Figure 5 shows a block made up of twelve octagonal plates that is ready for welding (see also our front cover illustration). Five tie bars, two of which are equipped with lifting hooks, were welded to each block. A giant positioner was used so that all the work could be done in the flat position.

Tolerances Critical

The welded blocks had to be machined to very critical tolerances, as the successful operation of the cosmotron depends on a very exact position of the magnetic field. The shaping of the gap actually approaches the limit of our present technical skill.

A bevel was first machined on the back edge of the blocks to allow them to nest together to the required radius of the quadrants. The face designed to serve as the base was finished on the same machine. The highly accurate contour of the gap was next machined. The tolerance was 0.0005 in., with a taper not exceeding 0.2 mil per inch over the entire length. After completion of the gap, the nose of the block was finished on the same machine.

Following inspection, the faces of the blocks were painted with regular metal primer, and the machined parts, including the slot, were painted with a rustproof compound. The rest of the surface was covered with a waterproof sealer. Each block was wrapped in waterproof paper for shipment to Brookhaven.

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Inco filler wire on disposable spools for fast welding by Inert Gas Shielded Metal Arc Welding of Inco Nickel Alloys.

Tubes containing cut lengths (36") of non-coated wire for Inert Gas Metal Arc Processes.

There's something new in filler wire for inert gas metal arc welding now.

Inco engineers have developed a special composition wire that will produce sound welds of the proper metallurgical balance on Inco Nickel Alloys.

Disposable spools of this new filler wire are available for any of the consumable electrode processes used to weld materials ⅛" thick and over. (For tungsten electrode process Inco produces rods in cut lengths of 36", in sizes from 1/16" to 5/32".)

The spools are supplied in wire diameters of .035, .045, and .062 in the Inco "60" series of welding materials.

For inert gas metal arc welding of Monel® you should specify "60" Monel Rod or Filler wire, for Nickel specify "61" Nickel Rod or Filler wire, for Inconel® – "62", for "K"® Monel – "64", for Inconel "X"® – "69".

Of course, like other Inco Nickel Alloy materials, filler wire is on extended delivery now. That's because so much is needed for defense. Therefore, it will pay you to keep in touch with your distributor regarding available supplies.

To help you determine which Inco welding materials to use for specific applications, Inco's Technical Service Section has prepared a Welding Materials Guide. It covers welding solid materials, clad materials, dissimilar metals and overlays. You can get a copy by writing directly to Inco.

INCO TRADE MARK

THE INTERNATIONAL NICKEL COMPANY, INC.

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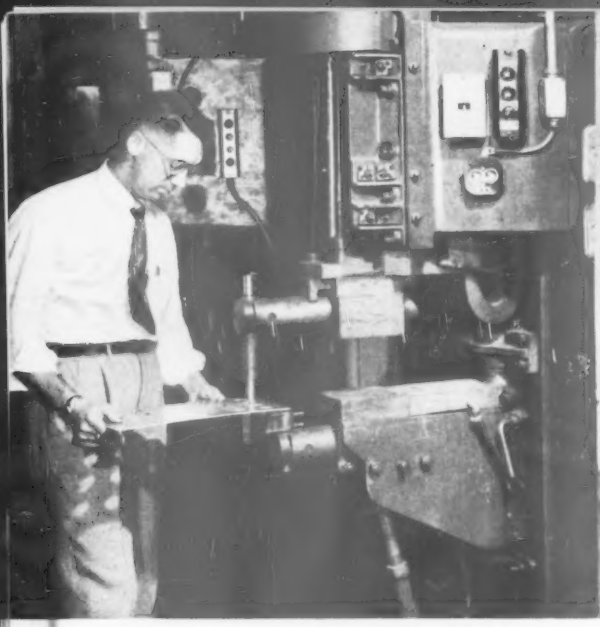
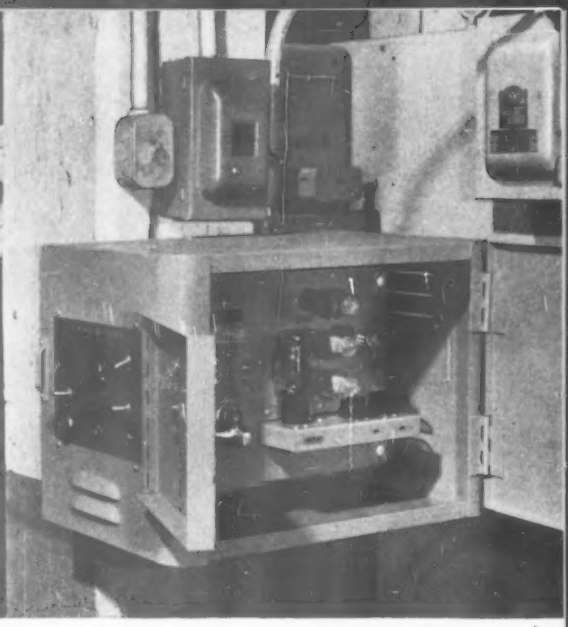
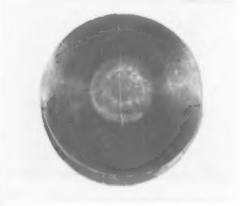




Laboratory Tests Prove Resistance Welding Aluminum Is Easier with . . .

NEW G-E UP-DOWN SLOPE CONTROL

WITHOUT SLOPE CONTROL



ELECTRODE PICKUP is noticeable on this electrode, used 40 times without Slope Control.

WITH SLOPE CONTROL

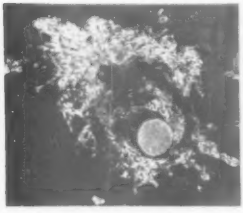
LONGER ELECTRODE LIFE with G-E control. Above used on aluminum 1700 times—no cleaning.

HOW IT WORKS: This new G-E control increases heat input gradually (Up-Slope) to full-heat, reducing tip pickup. After full-value time has elapsed, heat is gradually decreased (Down-Slope), reducing porosity and cracking.

UNIFORM WELD STRENGTH is obtained only with G-E control because precision timing is used at point where Down-Slope starts.

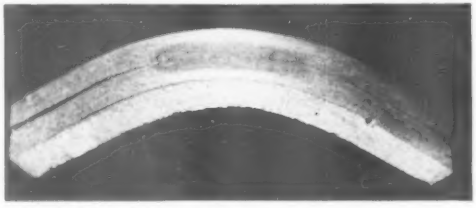
For more information on the complete line of G-E resistance welding control, contact your nearest G-E apparatus sales office. Write Section 645-57 for bulletins GEC-902 and GER-610 on Up-Down Slope Control.

Your resistance welding machine manufacturer or his agent will be glad to help you with resistance welding problems. *General Electric Company, Schenectady, N. Y.*



SEVERE BURNING caused by current surge in welding aluminum without Slope Control.

NO BURNING when G-E Slope panel automatically controls heat input in stud-welding aluminum.



DUCTILE WELDS, such as this aluminum alloy nugget bent 45°, show no cracks because of the tempering effect of gradually decreasing heat input. This means fewer rejects.

RESISTANCE WELDING CONTROL

GENERAL ELECTRIC

Costs per Pound and Square Inch

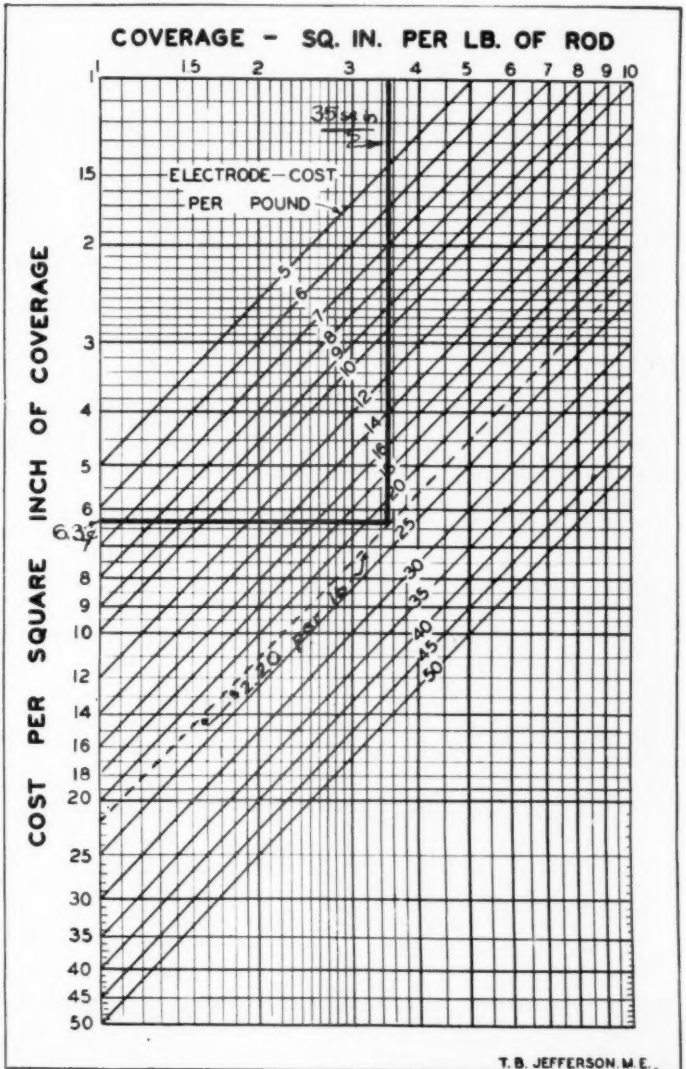
BY T. B. JEFFERSON

Cost of the deposited weld metal when overlaying or building up surfaces can be figured by simple arithmetic if the estimator knows the price per lb of the filler metal and the number of sq in. of surface each lb of filler metal will cover. The accompanying chart will simplify the job even further by eliminating the arithmetic.

For an example, it is found by research that a lb of hard-facing material covers 35 sq in. when deposited 1/16 in. thick. The hard-facing rod costs $2.20 per lb, and it is desired to know the material cost for a deposit covering an area of 10 sq in.

The answer is found as shown by the heavy lines on the chart. First, a straightedge is placed so as to form a diagonal line indicating a cost of $2.20 per lb. This is done by connecting 22 on the vertical line at the extreme left with 2.2 on the vertical line at the extreme right. The next step is to locate the point where 35 sq in. (horizontal scale) intersects the new $2.20 cost per lb diagonal. Reading this point on the vertical scale, it will be found that the cost per sq in. of coverage is 6.3c. The cost for a 10 sq in. area is naturally ten times as much or 63c.

Since the accompanying chart is of a logarithmic type, it will be suitable for materials within any price range or for all areas if care is taken to place the decimal point correctly. For example, in the previous problem, the same diagonal could be used if the material had cost 22c a pound instead of $2.20. In this case, the cost for one sq in. would have been 0.63c—one-tenth the previous cost since the price per lb for the material is only one-tenth as much. The material cost for the 10 sq in. area would be 6.3c.



Reprinted from THE WELDING ENGINEER, *June, 1944*

IF COVERAGE in square inches per pound is not known, refer to Engineering Data Sheet No. 144. See THE WELDING ENGINEER, September, 1952, page 51

How to save money on repair parts!

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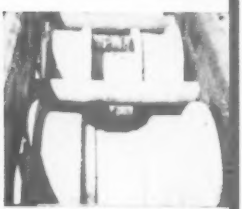

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VICTORTUBE	Severe abrasion	Scarifier teeth, dredge cutter blades, posthole augers, oil field tools, ditcher teeth
VICTORITE	Earth abrasion or sliding friction	Plowshares, cultivators, steel mill guides, cement chutes, shaft bearings, rolling mill guides
VICTORITE 1	Corrosion, heat and abrasion	Saw-teeth, carbon scrapers, wire guides, rocker arms
VICTORITE 6	Red heat, impact, corrosion and abrasion	Blanking, forming and trimming dies; cams, hot punches, pump shafts
VICTOR TUNGSMOOTH	Thin cutting edges	Coal cutter bits, brick augers, pug-mill knives, screw conveyors

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How PROSPEROUS Is The USA?

Just how prosperous *are* the people of the United States?

The sole purpose of this message is to help clear up the confusion and controversy that surrounds this important question.

To find out how much prosperity, or material well-being, the people of the United States now enjoy, it is necessary to get answers to these questions:

1. As compared with other times, what is the total amount of goods and services that we have available for our enjoyment?

2. How great, on the average, is the share of each American in this prosperity?

3. How does our prosperity compare with that of other nations?

National Product at Peak

The government statisticians who do the bookkeeping for the nation produce a figure called the Gross National Product. It is supposed to be the total obtained when you multiply the amounts of everything we produce by the prices of everything produced. This year the GNP, as it is commonly tagged, will add up to something like $345 billion.

Since this will be the highest total that GNP has ever attained, some people will acclaim it as evidence that we now are enjoying the greatest prosperity on record.

The GNP, however, is not an accurate yardstick of prosperity. It may go up because of price inflation alone without any increase at all in the output of goods and services. Also the GNP includes very large amounts of goods and services, such as those for the military, which are in fact a result of misfortune rather than of a condition that might properly be called prosperity. Moreover, there is no deduction from the GNP to make allowance for the equipment that is worn out in producing it.

Little Recent Progress

When we make adjustments such as these—to find out how much of our production really is available for the use and enjoyment of the civilian population—the *adjusted* national product since the beginning of World War II comes out about as follows. The effects of price inflation have been removed from these figures.

YEAR	ADJUSTED NATIONAL PRODUCT	
	Billions 1951 Dollars	Index (1946 = 100)
1940	$176.2	76
1946	232.5	100
1947	240.7	104
1948	244.3	105
1949	239.7	103
1950	260.9	112
1951	267.9	115
1952	264.3	114

From this table the fact stands out that progress in raising our level of prosperity has been halting. What progress we have made came in a few dramatic increases before or after a military build-up. Aside from those, the progress has been fairly slow. This year, 1952, it has been particularly discouraging.

Again, when account is taken of the number of people who must share in the goods and services that are available, our progress is even less marked. This is shown by the following table which gives the share of the average American in the national product. This, as the table indicates, is arrived at simply by dividing the total of available goods and services by the population on hand to share in them.

YEAR	POPULATION Millions	ADJUSTED NATIONAL PRODUCT Billions 1951 Dollars	ADJUSTED NATIONAL PRODUCT Per Person
1940	132.0	$176.2	$1,335
1946	141.3	232.5	1,645
1947	144.0	240.7	1,672
1948	146.6	244.3	1,666
1949	149.2	239.7	1,607
1950	150.6	260.9	1,732
1951	154.4	267.9	1,735
1952	156.9	264.3	1,685

Here it is clear that we have made little or no headway since the end of World War II.

U.S. Compared to Other Nations

Although we are making slow progress in increasing our prosperity, as measured during recent years by the amount of goods per person, we still are by long odds the most prosperous people on earth. This can be seen from the following table. It offers a rough measure of how the adjusted output of goods and services per person in the United States compared in 1951 with that in a number of other countries:

COUNTRY	PER PERSON
United States	$1,735
Canada	1,231
United Kingdom	614
France	510

To figure more closely "How Prosperous is the U.S.A.?" we must answer a number of other questions. One of the most important will be the subject of a later editorial in this series. It is "Who Gets What?" How have various income classes and occupational groups shared the total available goods?

Another question that has a basic bearing on the quality and durability of our prosperity is "How fast are we using up irreplaceable natural resources, such as oil, iron ore, and copper, to sustain it?" Any attempt to deal with this very complicated question must also be deferred.

A Problem for the Future

In the meantime, however, key facts about our prosperity are that:

1. Most of the increase in the nation's total production in recent years has been to meet military requirements rather than to improve the American standard of living.

2. The increase in the supply of goods and services actually available for the average American has been slow and halting.

3. We Americans are still extremely well provided with the good material things of life, as compared with peoples in other lands.

These three facts bring to mind a whole series of policy questions. What can be done to speed up progress in improving our prosperity? What—to repeat the question discussed in the previous editorial in this series—can be done to make our prosperity less precarious?

Here, however, the purpose is not to prescribe. It is simply to indicate as accurately as it can be done in a brief article the actual state of the nation's prosperity.

In doing this much, it can properly be remarked that the record presents to the American economy both a problem and an opportunity of surpassing importance. It is that of building a prosperity that will be both more progressive and more secure than any we have known in recent years. In the light of what clearly remains to be done, we shall make a grave mistake if we use up any of our energy in congratulating ourselves on the relatively meager progress here recorded.

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...or submerged arc welding

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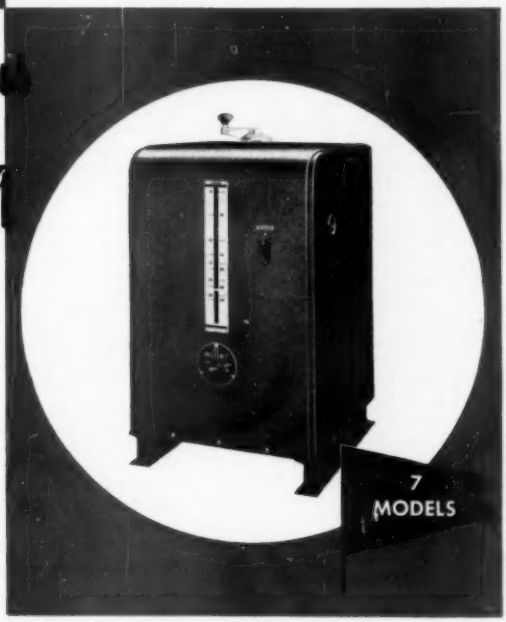

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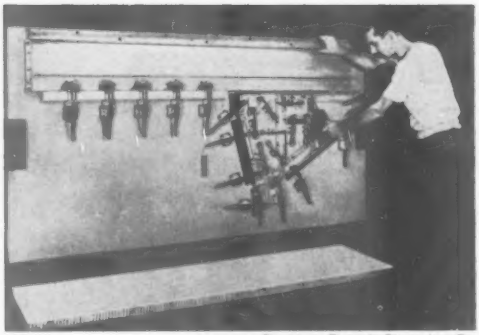
Courtesy The Gasflux Co.

"PAINTING" a copper-to-copper joint with flux is done with the flame at start of a brazing operation



Courtesy Detroit Stamping Co.

TOGGLE clamps maintain holding pressure at 500 F during stress relief of magnesium cabinet assemblies

Fluxing Brazed Joints

By A. L. Johnson

Our business is to rebuild hermetically sealed household refrigeration units. Rebuilt units will average 25 to 35% new parts (domes, floats, receivers, etc.), which means that a large portion of the joints are made over again in our plant.

The variety of combinations to be joined includes: ¼-in. copper tubing to 5/16-in. steel tubing; ⅜-in. copper tubing to ⅜-in. swaged copper tubing; ¼-in. copper tubing to a steel bushing; ⅛-in. copper tubing to a steel fitting. For the copper-to-copper joints, we use a phosphorous-copper brazing alloy; for the copper-to-steel joints, a silver alloy (either 45 or 47% silver).

When we started operations, we had some trouble with leaks in the brazed joints. Improper fluxing turned out to be at the bottom of much of our trouble. The operators invariably used the paste flux too thick and used too much of it. We tried to remedy this by giving the operators fluxes that were prepared to a certain pouring consistency. At the end of each day we would collect all the unused liquid flux and dilute it to the proper consistency for the next day's work. This was troublesome and expensive, but it did result in better brazed joints with fewer leaks.

We were fairly well satisfied with what we were doing until someone suggested that we try the flame-fluxing method; *i.e.*, passing the fuel gas for the torch through a flux container. The results were extremely good. Since adopting the use of the flux-bearing flame, we have reduced the amount of brazing alloy consumed and have cut leaks by more than 60%. Other advantages are: better alloying action of the brazing materials with the base metal; fewer inclusions, gas pockets and voids; less cleaning after brazing; lower cost per joint; less mess and bother around the brazing operation.

The proper method of using the flame is to "paint" the area around the joint with a minute coating of flux. Wherever the tip of the flame touches, the surface is sufficiently fluxed.

Picture at top left shows how a copper-to-copper joint is painted with flux during the brazing of a ¼-in. tube into a ⅜-in. tube. The two tubes are placed in a holding fixture, and the tip of the flux-bearing flame is placed around the joint area to coat it with flux. Next, the flame is directed toward the heavier of the two tubes for preheating. When the work reaches the proper heat, the brazing alloy is touched to the joint area and flows throughout the joint by capillary action. When this takes place, the flame is slowly withdrawn from the work.

* * *

What Heat Does to Titanium

HEAT does nothing to the mechanical properties of titanium in the range from 400-800 F. At temperatures above 800 F, titanium loses strength and becomes embrittled if heated for long times. For short-time heats, however, temperatures of as high as 2,000 F will not cause loss of many of the metal's valuable properties, according to W. C. Beck, engineer of the Mallory-Sharon Titanium Corp., Niles, O.

* * *

End Magnesium Distortion

THE high coefficient of expansion and high heat conductivity of magnesium mean a problem in distortion control when large sections of the lightweight metal are heated for stress relieving. If stress relieving is not done, however, weld cracks may develop in service. So what's the answer?

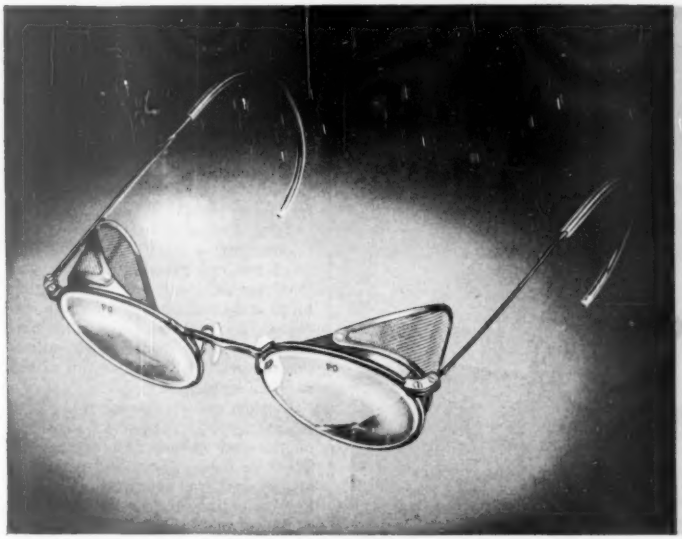
Brooks and Perkins Incorporated, of Detroit, was caught on the horns of the above dilemma in an order for magnesium radar cabinets. The Army specs required stress relief of all weldments of extruded sections. Distortion of the cabinet sections, however, would disrupt the delicate electronic equipment of the radar sets and make them useless.

Solution: clamping for stress relieving.

Each magnesium assembly of welded extruded sections, equipment mounting blocks and angle plates is fastened to a special stress-relieving fixture by means of toggle clamps. As many toggle clamps are used as are necessary to maintain the rigidity of the welded assembly. The clamped assembly is rolled into a furnace and held for one hour at 500 F. The high temperature has caused cracks to develop in the asbestos backing of the fixture, but the toggle clamps retain their snap-action holding pressure. There is no distortion of the stress-relieved cabinet sections.

After the entire radar console cabinet has been completed, it is placed in the furnace for additional stress relief as a unit.

PENNSYLVANIA OPTICAL COMPANY



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PAGE Welding Electrodes AND Rods

Cutting Off Track Rails

THE CITY fathers of Monaca, Pa., wanted to do a repaving job on Main Street, but there were nearly two miles of raised streetcar track in the way. Because of low curbs, the street elevation could not be increased by covering the tracks, and the cost of digging up the old rails was prohibitive.

The city fathers decided to try flame-cutting. A private cutting and welding shop contracted for the job and finished both the cutting and the removal of the track (10,037 ft of track) in 23 working days.

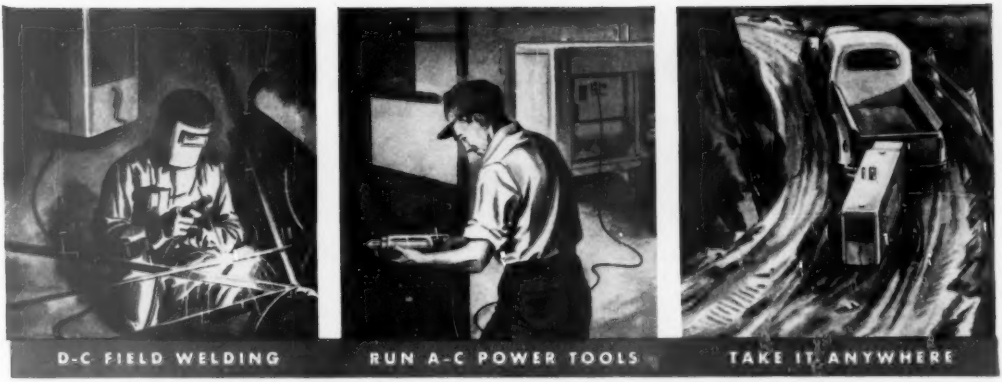
First step was to chip out with pneumatic hammers the cement that filled the rail grooves. The cut was then started with a hand cutting torch and continued by a cutting machine. The torch on the machine carriage was slanted at an angle, allowing removal of the entire top of the rail in a single cut.

Cutting speeds ranged from 8 to 12 ipm, depending upon the condition of the rail groove. An average of 5,000 cu ft of oxygen and 870 cu ft of acetylene was consumed each day. For the entire job, the total gas consumption was 115,000 cu ft of oxygen and 20,010 cu ft of acetylene.

—Courtesy Linde Air Products Co.

Aluminum Tote Boxes

MATERIALS-handling box of aluminum weighs 245 lb and will carry a 5,000-lb load. A comparable steel box would weigh 620 lb. The boxes were made for use at the Cleveland works of the Aluminum Co. of America by the Powell Pressed Steel Co., Hubbard, O. Each box measures 60 by 42 by 36 in. and was fabricated from 61S alloy sheet and extrusions. The welds were made by either the inert-arc or the inert-arc metal-arc process.



Look what you can do with the New Westinghouse Engine-Driven D-C Welder

Here is a lightweight, 200-ampere, gas engine-driven welder with up to 3-kw stand-by power—all in the same unit. By simply plugging into convenient receptacles on the a-c power panel, the operator may obtain power for drills, grinders, pumps, lights and other electrical equipment.

LIGHT—The auxiliary generator power in this machine is gained at no penalty in weight. The 1,150 pounds represent the lightest possible engine-driven welder with stand-by power that you can buy today. The welder is rated at 200 amperes, full 60-percent duty cycle, NEMA rated, with a maximum of 250 amperes.

COMPACT—This self-contained unit is only 39½ inches from the base plane to the top of the lifting eye. Its over-all length is 62⅝ inches. The welding generator is self-excited and close coupled to the driving engine.

VERSATILE—This welder is valuable in construction and maintenance operations on gas and petroleum pipelines, road-building projects, railroads—in fact at any remote site where there is no access to ordinary power supply. In disaster areas, this welder can power vital electrical equipment until normal service has been restored. The standard unit is skid mounted for truck transport or may be mounted on a high-speed, pneumatic-tired trailer.

For more information contact your nearest Westinghouse representative, or write to the Westinghouse Electric Corporation, Welding Division, P. O. Box 868, Pittsburgh 30, Penna. Ask for Booklet B-5455. J-21710

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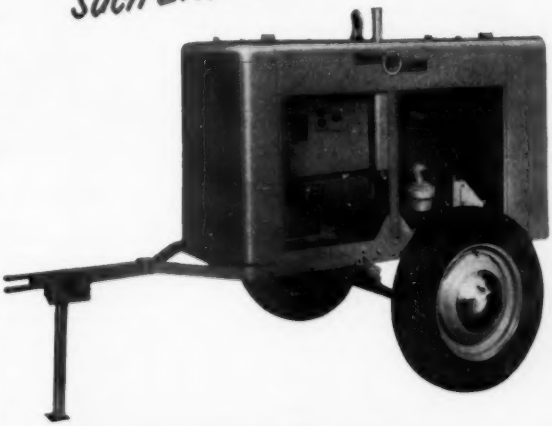

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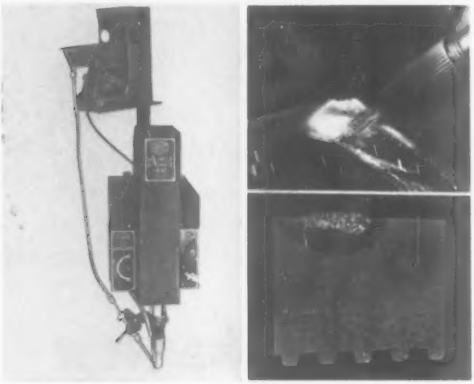
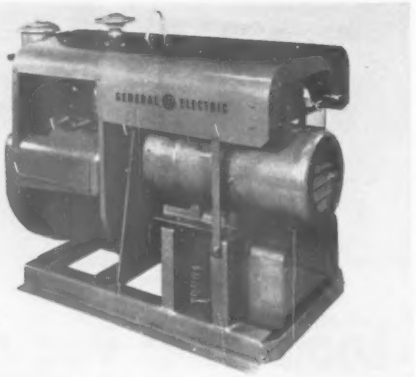
WELDING EQUIPMENT

New Products . . .



INERT-ARC HARD-FACING equipment includes a vibratory hopper (top left). Top right shows carbides dropping into pool. Lower right shows carbide facing



NEWEST G-E engine-driven welder is small enough to fit crosswise in a pick-up truck. Range is 40 to 250 amp. D-c outlets permit operation of tools and lights

Inert-Arc Hard-facing

251 A NEW automatic hardfacing process utilizes a vibratory hopper assembly to deposit tungsten carbide particles just behind the weld pool. The new rig grew out of a need for an improved method of depositing hardfacing material on oil well tool joints.

At left above may be seen the automatic "Heliweld" inert-arc head with the vibratory hopper assembly attached. Close-up views (top right) show tungsten carbide particles being fed into the elongated molten pool behind the arc. At bottom right, a cross-sectioned tool joint shows good distribution of correct particle size and the narrow heat-affected zone.

Use of the new outfit is limited only by the ability to position the work and the arc in the proper relationship. The rate of tungsten carbide feed from the hopper is electrically controlled to deliver precise quantities. Tests indicate that hard-facing with this process produces greater abrasion-resistance than other arc methods.

AIR REDUCTION SALES CO., New York City 17.

* * *

Copper Electrode

252 A NEW shielded copper welding electrode and welding procedure for metallic arc welding of copper alloys will also perform well on cast iron and steel. The "Kop-R-Arc" electrode is the result of several years of research work and is recommended for strong and ductile welds on copper vessels.

KREMBS & Co., Chicago 10.

* * *

R-W Die Adaptor

253 EITHER spot welding, projection welding, electrical upsetting or resistance-brazing can be performed with a versatile new "Nu-Twist" die adaptor. A quick change of electrode inserts is all that is necessary to adapt it for the various jobs.

Unique design, having no threads or tapers on the holder or inserts, enables the operator to release or secure the electrode with a simple turn of the locking nut. A clearance space of only 1/16-in. is ample between the upper and lower electrode inserts when replacement is made.

Because it cuts to seconds the time necessary to change a resistance welder die set-up from one operation to another, the Mallory die adaptor is particularly recommended for short production runs.

P. R. MALLORY & Co., INC., Indianapolis 6, Ind.

Engine-Driven Welder

254 A 60% DUTY cycle can be handled by a new 200-amp engine-driven d-c arc welder. Designated as type WD-42AGW, the welder has a current range of 40 to 250 amp and can be used with a number of electrode sizes for repair, maintenance and construction.

Complete with its Wisconsin air-cooled engine, it will fit crosswise in a standard pick-up truck. Optional equipment includes a trailer equipped with fittings for pressure lubrication.

Forced ventilation keeps the welder cooled within safety limits when the welder is on a 60% duty cycle at rated load. Heavy overloads for short periods will not cause harm.

For easy maintenance, either the generator or engine can be removed quickly for overhaul and replaced by a standby unit. A vacuum-operated idling control saves gasoline when welding is not being performed.

GENERAL ELECTRIC CO., Schenectady 5, N. Y.

* * *

Gloves Stand 800 F

255 ALL-LEATHER heat-resistant gloves are claimed to stand 800 F. The soft and flexible leather is impregnated with insulating and refractory materials. Inseam construction guards the threads against undue wear. The inner lining, of soft, selected leather, is sewn into finger tips to prevent separation.

MINE SAFETY APPLIANCES CO., Pittsburgh 8, Pa.

For more information on these products, fill in item numbers on cards, pages 33-34

BLUEWELD

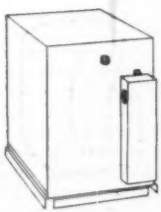
Aridair

ELECTRODE
Moisture Content
STABILIZER

worth its weight in gold

FOR
Low Hydrogen
and
Stainless Steel Electrode
Arc Welding Applications

Specifically designed and engineered to maintain correct moisture content.



EXCLUSIVELY ARIDAIR

- *Chemically dried air*
- *Shelf circulation*
- *Electrically heated*
- *Thermostatically controlled*
- *Recessed shelving*
- *Rigid construction*
- *Multiple unit stacking*

Fred C. Archer, Inc.

MANUFACTURER
MILWAUKEE 3, WISCONSIN

Midget X-Ray Machine

256 LESS than 15 in. in diameter and 44 in. long, a new GE industrial X-ray machine packs a 250-000-volt capacity. It is 56% smaller in size than the conventional X-ray unit.

Its weight is only 150 lb, just 1/8 as much as the regular apparatus. Capable of inspecting 3½-in. thick weldments and castings, it can be used in the field very easily because of its light weight and portability. So far it has been used in naval shipyards to inspect critical welded seams during and after fabrication. As designed by the Navy, the X-ray unit is carried on a two-wheel trailer about 6 ft long that also packs 200-ft extension cables, the transformer, power supply and other accessories.

Secret of the size and weight reduction is a high-frequency resonant transformer that eliminates the need for a closed iron core ordinarily used in industrial X-ray transformers. Another contributing factor is the use of gas insulation instead of oil.

Magnesium and other light metals can be inspected with this X-ray apparatus because of a beryllium window on the special multi-section X-ray tube. This allows the "soft" rays to escape from the tube. The tube is grounded at the end, so that the X-ray source end of the tube can be inserted inside of pipes and castings to use the "inside-out" inspection technique.

GENERAL ELECTRIC CO., Milwaukee 14.

* * *

New Nickel Electrode

257 ALL TYPES of cast iron may be welded with new "Nickel-Arc 60" electrodes on a-c or straight-polarity d-c. The coating is said to be free from injurious gases. Soft as-welded deposits make them handy for repairing broken or worn castings or for correcting machining errors without preheating.

Color of the weld deposit is said to be a close match to the parent metal. No special techniques are required for multiple passes. Weld deposit is said to be easily machined.

ALLOYS RODS CO., York, Pa.

* * *

R-W Tip Cleaner

258 NEWEST aid to resistance welding operators is the "Maintain-A-Contour" electrode conditioning kit. The plate holder (No. 1 in the photo) is inserted between the electrode tips and moved circularly until the complete tip contour is seen making contact with abrasive cloth on the plate.

Six sets of contour plates for 2, 3, 4, 6, 8 and 10-in. radii-faced tips are included in each kit. Rolls of abrasive mounts on spools are included in kits in various grit sizes. The all-steel storage chest has a recessed handle, a piano hinge, barrel lock and keys. The S-M-S contour plates for finishing tips can be obtained in any radius desired; they are about 2-in. in diameter.

S-M-S CORP., Detroit 11.

* * *

180-Amp Ground Clamp

259 SPECIALLY-produced for farm welders, inert-arc machines and other equipment in the 180-200 amp field, the new Tweco "Cub" Model GC-200 ground clamp is now available. It has familiar Tweco features such as the protruding upper lip for extra leverage in attaching the clamp, the wide jaws for added conductivity, the serrated edge on the upper jaw for scraping off rust, scale and spatter, a fully-insulated spring and a simple bolt and clamp connector.

TWECO PRODUCTS CO., Wichita 1, Kansas.

* * *

INFO-AID CARDS

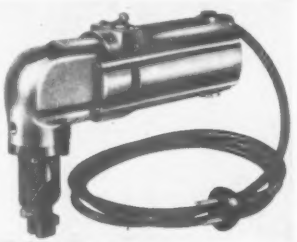
On pages 33-34, filled out with item numbers of products catching your eye, will bring you additional information about them.

Carbide Tool Brazing

260 USE of plymetal shims for brazing carbide tool tips has become a generally-accepted method in U. S. industry, according to The American Platinum Works. Principal labor-saving factor is the use of one plymetal shim instead of the three formerly needed. After fluxing and positioning, heat is applied to the tip. Almost no sandblasting or rubber wheel clean-up is necessary.

THE AMERICAN PLATINUM WORKS, Newark 5, N. J.

* * *



Portable Nibbler

261 A NEW portable nibbler is said to cut through 14 gage stainless, mild steel, galvanized iron and similar materials. Called the "Little Wonder," the nibbler cuts holes in tubes and ducts with accuracy.

For use as a hand tool or mounted in a vise, the "Little Wonder" has a minimum cutting radius of 7/8-in. It weighs 7½ lb and its length is 10-in.

FENWAY MACHINE SALES CO., Philadelphia 2.

* * *

Aluminum Solder

262 AN 800-deg heat is all that is required to solder aluminum or pot metal with a new "Chemalloy" bonding alloy, it is said. No flux, special cleaning or joint preparation are needed, says the manufacturer. When the base metal reaches 800 F, the rod is merely rubbed on and will join almost any zinc-base metal. The deposit in turn will take soft solder to permit attachment of radio or electronic connections to aluminum sections.

SIGHT MASTER CORP., New Rochelle, N. Y.

Rectifier D-C Welder

263 IMPROVED Miller selenium-rectifier d-c arc welders are claimed to provide a high short-circuiting current that provides a pulsating d-c current. The latter insures faster electrode deposition and sounder, denser welds. Using a "magnetic amplifier" principle, the new designs are claimed to offer outstanding welding characteristics. Remote operation is simple with a special electric control.

Illustrated above is the Model 100 for light d-c applications. There are three larger models, the largest being the 400 amp model for heavy production welding.

MILLER ELECTRIC MFG. CO., Appleton, Wis.

* * *

Tweezer Spot Welder

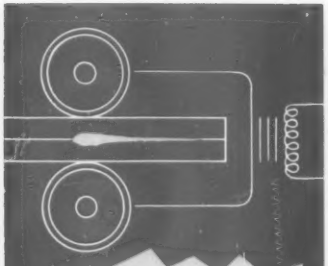
264 INSTRUMENT-quality welds can be made with the Model 1012 "Unimatic" tweezer-type spot welder, it's said. It features an improved electrical circuit, a completely reliable electrode switch assembly and a wide capacity of materials and thicknesses. Typical jobs include welding two 0.0008-in. diameter copper or nichrome wires or two 0.018-in. sheets of Type 302 stainless.

Other data on the little welder: dimensions, 8 by 10½ by 4½ in.; size of electrode assembly, 1 by 2 by 3 in. (less electrodes); weight, 17 lb; welding throat depth, 2¼ in.

UNITEK CORP., Pasadena 8, Calif.

(Turn to Page 78)

FOR RESISTANCE WELDING
AT ITS FINEST . . .
Always Specify
FEDERAL
FIRST IN RESISTANCE WELDING
This two-post spot welder, designed and built for a leading automobile producer to simultaneously weld three sections of cowl ventilator air chamber to dash panel is an example of Federal welder design flexibility.
Tooling, consisting of shunt die and hydraulically operated guns can be readily modified for welding of other parts with consequent savings in capital expenditure and changeover time.
THE FEDERAL MACHINE & WELDER COMPANY
WARREN
Federal WELDERS
Warco PRESSES



Up to 150% longer electrode life reported by users

...that's why it pays to use AMPCO WELD* seam-welding wheels

Cut downtime and end costly production losses with Ampco Weld wheels. Laboratory controlled during manufacture, these wheels have outstanding durability and consistently high conductivity.

Ampco Weld hardness and toughness at elevated temperatures provide unusual wear resistance. Many users report up to 150% longer life with Ampco Weld seam-welding wheels.

Ampco Weld wheels are available as rough forgings, finished blanks, or completely machined to drawing, as you wish.

All meet or exceed RWMA specifications. Ampco Metal, Inc. gladly furnishes expert engineering service for specialized applications if you want it. Order Ampco Weld wheels now — and get tough with costs.

*Reg. U. S. Pat. Off., Ampco Metal, Inc. NW-6

AMPCO **Ampco Metal, Inc.**
Milwaukee 46, Wisconsin
West Coast Plant: Burbank, California

It's Production-Wise to Ampco-ize!

Wet Blasting Machine

265 LARGE, heavy weldments can be cleaned in the Model 64 "Liquamatte" wet blasting machine. The machine is 6 ft long by 6 ft 10½ in. deep by 8 ft 11 in. high and will handle single pieces or loads of pieces up to 3,500 lb in weight. It has two 49 by 36-in. counterbalanced doors and a 6 ft long accessory tank to receive the parts from the blast chamber for rinsing.

For cleaning parts, fine mesh abrasives suspended in water are propelled at the work by compressed air. Since the mesh is fine (80 to 2,500 mesh) close-tolerance dimensions are maintained and sharp corners, lines and letters in patterns, knurling, thin-walled sections, etc., remain undamaged and unaltered.

The Model 64 has two sets of armholes so that two operators can be working at once. There are three abrasive nozzles, individually controlled; each nozzle has different sized jets. The operator stands outside the cabinet, with his arms extended through the gauntlets and manipulates the abrasive guns and the work tables with his hands while operating the compressed air valve with his knee.

AMERICAN WHEELABRATOR & EQUIPMENT CORP., Mishawaka, Ind.

* * *

Eye-Wash Fountain

266 A NEW eye-wash fountain will quickly wet all parts of the face to wash away acid, dirt, heavy fumes or other contamination. The Logan fountain incorporates a special piping design that gently sprays a large volume of water at what amounts to neutral pressure, so that recontamination danger is almost eliminated. It may be mounted on a pedestal or on a wall.

LOGAN EMERGENCY SHOWERS, INC., Glendale, Calif.

(More New Products on page 95)

SPATTER CHATTER

Independent Research Proves Superiority of Cam-Lok Connectors

A world-famous manufacturer of welding equipment recently tested Cam-Lok Cable Connectors against competitive connectors. With a 400 ampere load, the Cam-Lok Connector showed only 10.6 millivolt drop, indicating negligible resistance. In comparison, a solid brass bar, the same size and shape as the Cam-Lok Connector, showed 5.8 millivolt drop, proving that the Cam-Lok Connector *is almost as efficient as a solid piece of brass.*

- **Double-Cam principle assures most perfect contact possible**
- **Solid brass, precision machined**
- **Positive vibration-proof connection**
- **No weaving, no arcing, no heating, no burning**
- **Time, money, trouble-saving interchangeability**

cam-lok
DIVISION OF EMPIRE PRODUCTS, INC.
P. O. Box 98-N Cincinnati 36, Ohio

"Lawn mowers, trucks, or carnival rides—I fix 'em all with ANACONDA-997 Low Fuming Bronze Welding Rods."

— says CLAUDE CAMPBELL
Warren County Welding Company
Lebanon, Ohio

Claude Campbell, owner of Warren County Welding Company, shows how he braze-welds a two-speed truck differential housing.

Campbell pauses for a breather in front of his shop that services four counties in southern Ohio.

Campbell demonstrates the use of AnacondA Welding Rods in making repairs on a power lawn mower.

"Lawn mowers and trucks are routine jobs. But it's not often a shop gets a carnival ride to fix. Last summer, at the county fair, an old Century Motor Ride burned out its motor brush—couldn't get a new one. The breakdown was costing them money. Busy as I was, I made one from a piece of spring, brazed with an ANACONDA Welding Rod. Got the ride going that night."

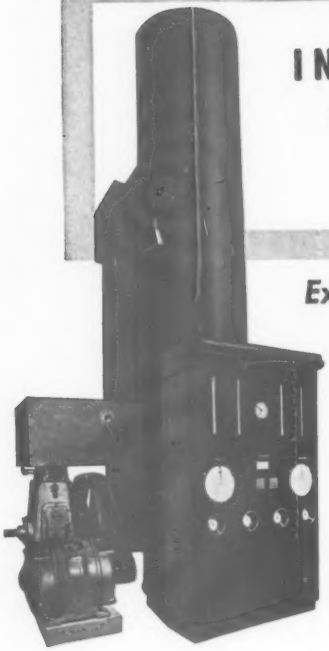
Claude Campbell takes work like this in stride. To build up worn surfaces or join cast iron, steel, or galvanized steel, he uses ANACONDA-997 (Low Fuming) Bronze Rods for speed and penetration—for low melting point and free-flowing qualities. He can file, grind, or machine bronze welds easily. Since less preheating is required, he finds little danger of warping or cracking. Economy of ANACONDA Rods is important, too.

Mr. Campbell praised his jobber, O. K. I. Welding Supply in Cincinnati. Their salesman—a practical welder himself—contributes many good ideas. The ANACONDA distributor near you can help you make more money and find the right bronze rod for the job. Consult him—and for more information, write for Booklet B-13 to The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

BRAZE OR WELD WITH CONFIDENCE

ANACONDA®

WELDING RODS



INDEPENDENT
GAS PRODUCING
PLANTS

Expansion Engine Type
Low Pressure
OXYGEN
AND
NITROGEN
Producing Plants

Built in standard sizes—15 meters or 530 cu. ft to 283 meters or 10,000 cu. ft.—in single and double rectification units. If you need them, larger sizes are available.

If the more than one quarter of a million INDEPENDENT CYLINDERS we have built were filled at one time, they would hold more than 50,000,000 cu. ft. of gas!

Furthermore, Independent Acetylene Cylinders hold from 5 to 10% more gas, and the uniformity of the monolithic filler insures even distribution of acetone. Oxygen Storage cylinders available in 12' and 20' lengths; capacities 850 and 1500 cu. ft.

10 C.F. 40 C.F. 60 C.F. 100 C.F. 150 C.F. 250 C.F. 300 C.F. 340 C.F.

WE INVITE YOUR INQUIRIES

INDEPENDENT ENGINEERING COMPANY, Inc.
Manufacturers of
CONSULTING · RESEARCH · DESIGNING
CYLINDERS AND GAS PRODUCING EQUIPMENT
ACETYLENE · OXYGEN · HYDROGEN · NITROGEN
O'FALLON 5, ILLINOIS

PHILADELPHIA

(Continued from page 45)

ventional single-impulse spot welding.

One more paper on resistance welding will have to be mentioned. This gave detailed instructions for establishing a quality control system that will spot significant deviations from average values. The method is not new, but the authors, R. K. Waldvogel and J. F. Radford, of the Crosley Division of Avco Mfg. Co., contend that welding literature published since 1940 does not tell how to establish a quality control system adapted especially to the needs of a resistance-welding department. Their paper included information obtained under actual shop conditions to substantiate the accuracy of theoretical statistical methods.

Pipe-Welding Session

One of the better technical sessions was the one held Friday morning on pipe welding. Welded piping may be defined as the lifeline of the petroleum industry, said Albert W. Zeuthen, of Socony Vacuum Oil Co. There are five chief types of pipeline in the refinery: for compressed air, for water, for oil, for steam and for chemicals. The first two are nonhazardous and operate at low pressures and temperatures, but the oil, steam and chemical lines are considered hazardous and may involve high pressures and temperatures. Gas welding is used on lines of 1½-in. diameter and under, arc welding on lines over 1½-in.

The arc welding of ½% chrome-½% moly steel pipe was investigated by J. Bland, L. J. Privoznik and F. J. Winsor, Standard Oil Co. of Indiana, using conventional cellulose-titania electrodes and low-hydrogen alloy electrodes. Results indicated that the static mechanical and impact properties of the low-hydrogen welds using a —60 F prefreeze for preheat and interpass temperatures were equivalent or superior to those obtained with cellulose-titania electrodes using 500-600 F preheat and a post-heat treatment of 1 hour at 1,250 F.

An extremely good piece of research, to determine a way to get along without back-up rings in pipe joints, was described by R. A. Mueller of the Crane Co., Chicago. Metal backing rings serve a very use-

ful purpose in the welded fabrication of piping, but they have several serious shortcomings. Fit-up must be accurate, or weld cracks will develop, which may lead to ultimate failure. It is both costly and time-consuming to match pipe ends of varying inside diameters and to machine for close-fitting rings.

The solution, as found by Mueller and his co-worker W. B. Root, is to use the inert-gas process. A protective backing of inert gas is employed on the underside of the pipe. The pipe interior is purged with either helium or argon at a pressure slightly greater than one atmosphere. Joints inert-arc welded by this method displayed full penetration and fusing on the underside.

The technique worked out is to butt the lands of the mating pipes together without any root opening. The lands are fused with the inert-arc torch (tungsten electrode) without the addition of filler metal. Welding then proceeds in the normal manner.

Less expensive gases for back-up than helium or argon may prove equally as effective, thinks Mueller. For example, it might be possible to place chunks of dry ice inside the pipe to provide a protective backing of carbon dioxide. Further research is to be done along this line.

Corrosion Prevention

The use of metallizing for corrosion prevention on iron and steel, as applied to welded steel construction in the marine field, was covered in a very good paper by Howard Vanderpool, Metallizing Engineering Co., Inc. The procedure is to spray over the naked steel a very thin coat of zinc or aluminum as a base for paint. It is estimated that paint life can be extended from two to five times by use of sprayed metal as a base. Likewise, the life of the zinc coating is extended two or three times by the use of paint. The ideal barrier paint coat over a sprayed metal surface is a good plastic organic material of the vinyl or chlorinated rubber types.

We have now discussed, admittedly in a sketchy fashion, some 28 papers. To the authors of the 40 papers not mentioned, our profound apologies. In one story in one issue of one magazine, there just isn't space to get around to everyone.

It was a grand convention, and we're glad to have been there.

Too many reject welds?

Type 300 Oven

Automatic thermostatic control, 175 to 550° . . . holds 350 lbs. of rods (18" size) . . . safe, adequate 840 watt heater . . . completely wired for 110/220 or 220/440 volt AC . . . sturdy welded-reinforced sheet metal construction . . . insulated — low heat loss, low upkeep.

Engineers say most defects in high-strength welds — X-ray porosity, rough welds, under-bead cracking, etc. — are caused by moist electrodes. Because low-hydrogen type rods absorb moisture so fast (often within 2 hours), rejects and reworks start piling up unless you protect unpackaged electrodes from moisture.

DryRod — the original shop-tested *portable* electrode oven — safely preserves the manufacturer's "baked-in" quality . . . keeps rods within the .2% moisture limit allowed by U. S. Govt. Specifications. DryRod's *exclusive circular design* assures even heat distribution without fans — plus giving great strength with light weight. Protect yourself against costly rejects, reworks, scrap loss . . . preserve electrodes conveniently, at low cost, with DryRod. Write for free bulletin.

DryRod — always made by, and now also sold by PHOENIX
Dry Rod—Trademark

Play safe — don't risk faulty welds, scrap loss, costly reworks or production slowdown due to wet electrodes. Maintain rods at top efficiency, ready for instant use on high-strength welds. DryRod pays for itself — costs less than 10c per day to operate . . . gives you convenient storage of varying sizes and types at point of use.

Phoenix Products Co.

DryRod Electrode Oven

DryRod—always made by, and now sold by PHOENIX

WRITE FOR FULL INFORMATION

X-DR-6

Phoenix Products Co.
4715 N. 27th St., Milwaukee 16, Wis.

☐ Send new bulletin DR-752 explaining how DryRod can save me money on high-strength welds

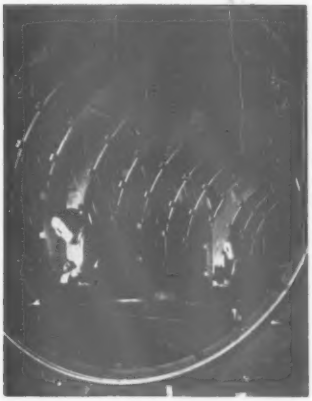
☐ Send chart showing recommended temperatures for various mineral-coated electrodes

Name .....

Company .....

Address .....

City ..... State .....



216,000 KVA Generator To Supply Atomic Plant

THE largest 3,600 rpm generator ever built is being installed at the Joppa, Ill., generating plant of Electric Energy, Inc. Made by General Electric Co., at Schenectady, N. Y., the generator is seen in the above picture as weldors join ribs and sides of a stator section on the big generator.

Four generators of this type will be in operation in 1954. Each has a rating of 216,000 kva.

* * *

Canada to Sell U. S. 77,000,000 Lbs Aluminum

LOST aluminum ingot production caused by the Pacific Northwest power shortage may be relieved somewhat early in 1953 by 77 million lbs. diverted by Aluminum Co. of Canada from the United Kingdom to the U. S.

Ward Van Alstyne, President of Aluminum Import Corporation, Alcan's U. S. distributor said, "The company has reviewed its other contract commitments and with the coöperation of the British government has arranged to postpone delivery of part of the metal scheduled to be shipped to the United Kingdom in the next few months. Consequently, instead of distributing 40,000,000 lb in the United States during the first quarter of 1953, we will distribute 77,000,000 lbs."

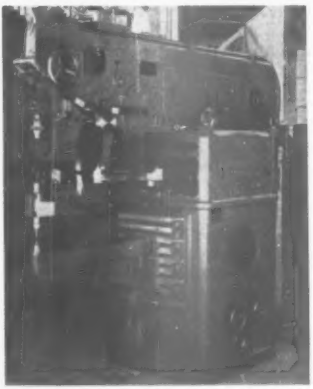
Alcan's ample supply comes from a completed power plant and smelter in northern Quebec. A second one will be completed in early 1953 in the same area. A British Columbia plant will also add 90,000 tons to Canadian production by 1954.

On the other hand, U. S. producers will be behind 150,000,000 lbs by the end of this year. This is the greatest backlog the industry has ever had.

Moreover, our producers told NPA that another cut of 10% in interruptable electric power on Nov. 17 in the Northwest and from TVA will cause a loss of 40,000,000 lbs per month.

To alleviate the situation, industry spokesmen asked the government to withdraw a reasonable amount from the national stockpile instead of adding to it at the present rate. This metal is needed to keep the industry operating and its labor force intact. The committee hopes that the power shortage will soon be over and production will be going full blast by the 2nd quarter of 1953.

* * *



IRON CURTAIN on welding machines made in East Germany parted momentarily for visitors to the Leipsig Fair late this summer. Here is a big spot welder made by Lokomotivbau Elektrotechnische Werke. We don't have any details on its capacity.

—McGraw-Hill World News

* * *

0.005 Stainless Welded Submerged in Alcohol

TECHNICIANS at the Naval Ordnance Laboratory White Oak, Md., spot weld tiny stainless steel I- and T-beams in an alcohol bath. Liliputian size of the beams, used to make model submarines for research work, is illustrated by their dimensions: flange width, 0.135 in.; flange thickness, 0.0083 in.; web height, 0.25 in. and web thickness, 0.0077 in.

Purpose of the alcohol bath is to control the heat in the tiny sheets before and after welding takes places and also to reduce oxidation and electrode contamination. Prior to using the alcohol immersion techniques, the relatively thin webs would often burn away before welding temperature was reached in the abutting flange.

A condenser-discharge type of welding circuit was the only one found feasible by NOL's Marvin Weinstein, physicist in the electrical evaluation division of the technical evaluation department. Welding times are short (between 0.001 and 0.010 seconds) because high heats are available from the capacitors. Special jigs made to tolerances of plus or minus 0.001 in. are utilized to hold the beam components in place during welding.

The actual welding is carried out on a converted milling machine which makes 240 automatic welds in a 10-in. length of I-beam. These welds are made in two operations of 120 welds each, requiring a total time of 10 minutes. Aiding Mr. Weinstein in converting the milling machine and designing the tiny structural shapes were Machinists I. Errera and G. Burke.

Consistent quality in production of the small structurals was obtained by watching several conditions. First, the voltage to which the condenser is charged has to be controlled within 3%. Forging pressure had to be built up consistently with its peak coming just after the weld was initiated. Size and shape of the electrode tip had to be determined by trial and error and once found had to be strictly maintained.

* * *

Individual Plant Problems Answered at Cleveland

SPECIFIC questions from visitors will be answered at the Plant Maintenance Conference in Cleveland Jan. 19-22. Facilities in panels, conferences and roundtables will make possible the treatment of about 5,000 individual plant problems.

Separately, on the floor of the Plant Maintenance Show, held at the same time, about 1,500 experts from 300 exhibiting firms will be answering questions on equipment. General chairman of the conference is L. C. Morrow, consulting editor, FACTORY MANAGEMENT & MAINTENANCE. Advance registration cards may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York City 17.

Sellstrom
QUALITY
EYE AND FACE
Safeguards

THE WELDING GOGGLES THAT SAVE YOU TIME AND MONEY

Here are the world famous Sellstrom No. 420 Welding Goggles. They are popular because the abundant ventilation reduces fogging to a minimum. They save you time and money because the welder is not forced to stop every few minutes to wipe the fog from the lenses. Here are the facts:

1. Each eye cup has six ½" ventilating ducts with two extra ventilating ducts on each side—a total of eight ventilating ducts for each eye cup — sixteen for each pair of goggles. No other goggles can equal this abundant air circulation.
2. The air ducts are so arranged that it is impossible for a single speck of light to penetrate through the air ducts.
3. The frame is moulded from tough plastic with all edges carefully rounded to assure maximum face comfort.
4. The special inner lens retaining rings are so firm that even a cracked lens remains in place.
5. A covered stainless steel nose bridge chain permits adjusting to 1/1000th inch for perfect fit. Single adjustment one-piece headband.
6. Extremely light weight. Including lenses 3½ ounces. Each pair in an individual carton.

If you are not now using the popular No. 420 Welding Goggles, we urge you to try them. They will delight your welders and they should delight you because they permit more welding per man hour.

Write us for the name of a nearby dealer who can supply the world-famous No. 420 Welding Goggles.

sellstrom
MANUFACTURING COMPANY

Let Sellstrom Quality Safeguards Protect Your Eyes and Face

626 N. Aberdeen Street, Chicago 22, Ill.

Tungsten Ores Sought by Free World

WHEN the Communist-led Fourth Field Army of General Lin Piao took over the Chinese provinces of Kwangsi and Kwungtun four years ago, it gained control of one-third of the world's tungsten ore production.

Since then the price of 60% ore concentrate has jumped from $2,000 to $6,500 per ton. We are gradually crawling toward self sufficiency, but it is slow going. Asian areas not controlled by the Communists are being literally combed for additional deposits of wolframite and hubnerite ores containing commercial quantities of tungsten. Some have already been found in South Korea that contain a very high degree, 1.7% of metal. One of the largest known deposits of wolframite is there and it is thought to hold proven deposits of 2,280,000 metric tons.

Nowadays, practically all of the Chinese tungsten goes to the Communists except possibly a small amount that can be smuggled out through Hong Kong.

Bolivia has received a $1,000,000 loan from the U. S. Export-Import Bank for expansion of its Balso Nigra Mine after signing a contract to sell 100% production to the U. S. Nationalization of the tin mines apparently will not affect the agreement.

Our largest development is at Tungsten, N. C., where we mine about 400 tons per day of 2% ore concentrate. Canada, previously not a very big supplier, is now beginning to mine ore also and is expanding production to 2,500 tons of concentrates annually.

The world production peak was reached in 1943 when 60,072 metric tons of 60% concentrate ore was produced. In 1951 the world figures were 50,126 tons. Of this amount the U. S. produced 5,693 tons with the balance coming from 34 different nations.

* * *

Ryan Lands Contract for Titanium Research

How best to process titanium for exhaust systems is the task of Ryan Aeronautical Co., San Diego, under the terms of a new Air Force contract. According to Brig. Gen. Kern Metzger, director of the Aircraft Production Resources Agency, the Air Force has set aside $5,000,000 to aid private industry in producing and working the new metal.

One of the research avenues explored by Ryan is the experimental use of ceramic coatings on titanium to see if they will provide protection against oxidation and absorption above 800 F.

If you do AC Bronze Welding, check these Advantages

- No snuff outs
- Easy striking
- Wear resistant
- Corrosion resistant
- Welds dissimilar metals
- High strength
- High ductility
- Can be used with AC or DC

You get them all with AMPCO-TRODE* "AC" Coated Aluminum Bronze Electrodes

THESE Ampco-Trode "AC" advantages mean lower welding costs for you—better, faster jobs—less trouble. Besides the advantages listed you also get a smooth bead that feather-edges perfectly into the base metal — whether it's used on cast iron, malleable iron, bronzes, some nickel alloys, or dissimilar metals.

Moreover, Ampco-Trode "AC" beads are free from porosity and surface pitting. Spatter loss is low, too.

Ampco-Trode "AC" is available in 5 grades having Brinell hardness ranging from 135 to 300, tensiles from 77,000 to 90,000 psi, and yield strengths from 35,000 to 69,000 psi.

For additional information about versatile, money-saving Ampco-Trode "AC" electrodes call your nearby Ampco distributor or write us.

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Lincoln Gives Prizes for Best Welded Bridges

WINNERS of the 1952 bridge design competition sponsored by the Lincoln Foundation have been announced. The program was titled "Welded Bridges for Steel Conservation" and succeeded in drawing design responses from all over the country. Average saving in steel made possible by these welded designs was estimated at 20%.

First award of $7,627 went to Elwyn H. King, Long Beach, Calif., whose welded design of a seven-span deck girder bridge indicated a saving in steel of 24% over what was actually used in erecting the bridge by riveting.

Kiser Dumbauld of the Ohio State Highway Dept. received second prize of $3,635 for his redesign of one of the state's bridges. His welded design indicated a saving in steel of 18% would have been realized if the bridge had been welded. He has received top awards in two previous Lincoln programs.

The third award of $2,078 was shared by Thomas Kavanagh of New York University and Leo Coff, New York City consulting engineer. Mr. Kavanagh has recently been made Head of the department of civil engineering at NYU and this award is the third time he has been similarly honored by the Lincoln Foundation in bridge design contests. Mr. Coff is an authority on prestressed concrete design.

Ten honorable mention awards were also made. A book is being planned by Lincoln on the competition just closed. Two previous books published by Lincoln have presented the significant results of the work in earlier welded bridge design programs.

About 73,000 tons of steel would be saved every year in bridge work by welded construction, commented Mr. Dumbauld, second prize winner. He also said that in 1952 welding would have saved 40,000 tons of the NPA allotment of steel to the Bureau of Roads.

* * *

First G-E Welding Distributor Named for Arizona

CONSOLIDATED Welding Supply, Phoenix, Arizona, has been named the first General Electric welding distributor in Arizona, according to Charles I. MacGuffie, manager of marketing for the G-E Welding Department. Consolidated will carry a full line of G-E welding electrodes, a-c, d-c, engine-driven, atomic-hydrogen and inert-arc welding equipment, accessories and renewal parts.

German Engineers Visit American Plants

TEN engineers from Germany are visiting here for six weeks to study U. S. methods of sheet metal production and fabrication. The visit is sponsored through the Mutual Security Agency.

One of the engineers, Otto Gengenbach, head of the research and process development division of Daimler-Benz A.G., is interested in American resistance welding methods.

Daimler-Benz A.G. is the largest manufacturer of automobiles in Germany, employing 10,000 workers in the sheet metal department alone. The average worker in the industry earns 2 to 2.30 marks per hour ($0.48 to $0.55) and works from 7 to 5, 5 days per week and 5 hours on Saturday. A loaf of bread and a qt of milk cost ½ mark each and the cheapest car, the Volkswagon, costs 9,000 marks. The average Daimler-Benz costs 20,000 marks.

During its visit in the U. S., the team will visit 12 different cities, 50 different plants, visit with plant executives, union officials and spend several days in Washington, D. C.

* * *

Bill Johnson Open House at Chicago, Dec. 1-5

A five-day welding show and open house will be staged Dec. 1-5 at the new location of Johnson Welding Equipment Co., Inc., 3421 West Belmont, Chicago 18. About 50 exhibits are scheduled including live welding demonstrations and electric and pneumatic tool displays.

Hours for the show are 1 to 9 p.m. every day. Any welding people interested in attending are asked to write to Bill Johnson for tickets and information.

* * *

"... So you've been carrying the torch for Emma all these years!"

A wide selection of models and variable speeds meet requirements for shop arrangement and dependable performance when you use ...

Strand FLEXIBLE SHAFTS

Flexible Shaft Equipment

There is a Strand flexible shaft machine to meet practically every industrial need ... floor models, bench models, overhead models, variable speeds and power. This is quality equipment that stands up under hard usage ... the kind you select because of dependability.

Review the models shown here, then write for catalog and full information.

FLOOR MODEL—the floor-mounted flexible shaft machine is one of the most popular. It can be moved from place to place. Amply powered, the stand is out of the way while the head is light and easy to work with. Model shown is three-speed mounted on swivel yoke adjustable floor type tripod. Available in ⅓ H. P. to 1½ H. P., inclusive.

BENCH MODEL—here is convenient flexible shaft equipment that can be mounted on bench right near the work. Portable to the extent that it can be taken from place to place. For steady, fast production, consider the bench-mounted flexible shaft machine as part of your production setup. Model shown is three-speed mounted on swivel type adjustable bench column. Available in ⅓ H. P.

OVERHEAD MODEL—for production line work, overhead-mounted flexible shaft machines are a real convenience. Motor and mechanism are out of the way and flexible shaft conveniently located. To meet your requirements, review all models of STRAND flexible shaft machines. Model shown is three-speed vertical type for overhead mounting ... it is available in ⅓ H. P. to 1½ H. P., inclusive.

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As a pioneer in the development of Low Hydrogen Electrodes, Arcos offers you the most complete selection available today. Whether your job involves welding mild steel, high strength-low alloy steels, sulfur-bearing free machining steels, chrome-moly steels, or low nickel alloy steels . . . you can be sure of the results you want.

Since 1942 Arcos has been turning out Low Hydrogen Electrodes under Stainless "quality controls". That's your assurance of consistently sound, high-strength welds on every job. It means there's nothing experimental about Arcos Low Hydrogen Electrodes. They've already been "tested and approved" on armor welding as well as commercial applications. ARCOS CORPORATION • 1500 South 50th St., Philadelphia 43, Pa.

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Specialists in Stainless, Low Hydrogen and Non-Ferrous Electrodes

Metallizing Film Shows Countrywide Applications

A new 16 mm. sound film in full color describes the metallizing process and shows how it has been applied in plants all over the nation. Maintenance departments are shown metallizing worn or damaged machine parts. Metallized aluminum and zinc protective coatings are shown on iron and steel structures.

One sequence depicts the Missouri-Pacific streamliner "Sunshine Eagle," which has 85,000 ft. of its underframes sprayed with pure aluminum to resist corrosion. Power capacitor cases are pictured being sprayed with zinc, a process that has replaced painting on this type of structure for one company.

Suitable for presentation to industrial, professional and educational groups the purpose of the film is to promote a broader understanding of metallizing. Its running time is 28 minutes. For information on borrowing the film, write to R. J. McWaters, Metallizing Engineering Co., Inc., 38-14 30th St., Long Island City 1, N. Y.

• • •

Biggest Display of Safety Equipment

VISITORS to the Fortieth National Safety Congress and Exposition were treated to the biggest exhibit of accident prevention equipment ever assembled. It occupied three areas in Chicago's Hilton Hotel (formerly the Stevens) and was open 4½ days. Some 175 sessions were held in various of the city's hotels. More than 500 speakers from industry, public life, the schools and various agencies took part.

Exhibitors showing safety equipment for the welding industry included the following: Advance Glove Mfg. Co.; American Chain & Cable Co., Inc.; American-LaFrance-Foamite Corp.; American Optical Co.; Ampco Metal, Inc.; Ansul Chemical Co.; Bausch & Lomb Optical Co.; Boyer-Campbell Co.; E. D. Bullard Co.; Chicago Eye Shield Co.; Davis Emergency Equipment Co.; Diversey Corp.; Dockson Corp.; Fendall Co.; Frommelt Industries; Industrial Gloves Co.; Walter Kidde & Co., Inc.; Kimball Safety Products Co.; Mine Safety Appliances Co.; Pyrene Mfg. Co.; Randolph Laboratories, Inc.; Sellstrom Mfg. Co.; A. O. Smith Corp.; G. H. Tennant Co.; Watchemoket Optical Co., Inc.; Willson Products, Inc. and Wheeler Protective Apparel, Inc.

• • •

To obtain additional information on any advertised products, use the cards on pages 33-34.

How Undergraduates Can Win $6,750 in Prizes

THE rules and conditions for the sixth annual competition of the Engineering Undergraduate Award Program have been released by the Lincoln Foundation. The rules have been changed in three important respects: (1.) The 46 awards to be made will be based on the best designs of a machine, machine component, structure or structural part designed for welded construction. (2.) Duplicate awards will be made for the best entries in both mechanical design and structural design. Additionally, three grand awards will be made to the best of the program designs. (3.) To permit participation in the program within the limited time available to students, all entries will be limited to no more than 20 pages.

The rules booklet gives suggestions for subject matter, a bibliography and previous award titles illustrated with drawings. Booklets can be obtained from the James F. Lincoln Arc Welding Foundation, Cleveland 17.

* * *

Crystal Ball Shows Improved Metals Picture

LOOK for an easing up of the shortage of stainless steel electrodes, maybe even in the higher nickel analysis, such as 25-20. According to informed sources, some of the specialty types such as the moly-bearing, etc., may not be too plentiful, but the picture will definitely improve.

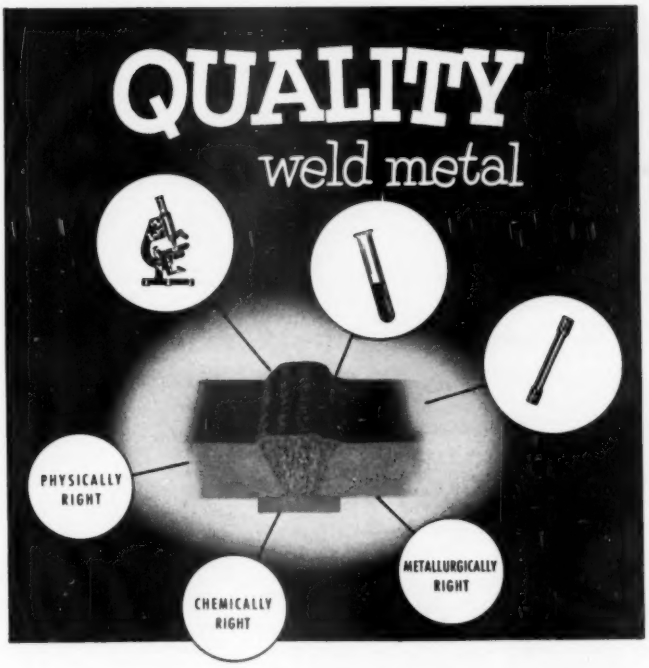
Do not, however, look for any change in the high-nickel electrodes for welding cast iron for a long time because the nickel picture has not improved enough to warrant additional use in this manner.

Copper at the present time is in approximate balance, but look for it to tighten up. Resistance to ceiling prices and resentment over the bonus paid for foreign copper (36½ cents per lb as opposed to a domestic price of 24½ cents per lb) will operate in the direction of less copper.

Aluminum is short right now (see the story in this issue about getting 77,000,000 lb from Canada). Aluminum welding rod manufacturers are working hard to keep up with the greatly accelerated demand that became apparent in September. The 3/32-in. wire is more wanted than other sizes because of increased use in automatic processes, but ⅛-in. wire is a close second in popularity.

* * *

Some circumstantial evidence is very strong, as when you find a trout in the milk.
—Henry Thoreau



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The production of top-flight welds largely depends upon the inherent qualities of the weld metal. That's why Arcos Stainless Electrodes must pass so many "quality controls" in manufacture. It's your protection for soundness, specific mechanical or corrosion resistant properties, or microstructures that can stand up to destructive service conditions.

Whatever your welding job, you'll find it pays to put your confidence in Arcos. Backed by long experience with fabricators' welding problems, and research in the behavior of various grades of electrodes in use and weld metal in service—you can trust Arcos Stainless Electrodes to deliver consistently dependable welding results. ARCOS CORPORATION • 1500 South 50th St., Philadelphia 43, Pa.

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Get all three of these important production advantages now . . . select top quality Atlantic Grinding Wheels, expertly engineered to meet your specific snagging requirements.

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LOWER OPERATING COSTS: Because Atlantic Wheels seldom have to be dressed, they eliminate the need for frequent replacements . . . assure lower operating costs on job after job.

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Radius Spot Weld Tips Claimed Advantageous

TRADITION is largely responsible for the widespread use today of pointed spot welding electrodes, says the *Ampco Welding News*, house organ of Ampco Metal Inc., Milwaukee. "Possibly when spot welding first came into use, when water cooled holders and alloy tips were unknown, the general practice was to use a piece of round copper rod sharpened to a point," comments the writer. This seems to have been the parentage of the present day pointed tip, used nowadays in about 90% of all spot welding applications.

Sound reasoning and many years experience have convinced the Ampco writer that radius-faced tips are more suitable for general use. Exceptions are where tight fits or restricted working conditions make the pointed tip more practical.

Reasons given for the radius-faced tips advantages: 1) Higher consistency in weld strengths can be obtained. Pointed tips have a small flat welding face that changes size with relative rapidity. Contact area, current and pressure factors are more favorable with radius-faced tips and easier to gage with accuracy so should be stronger than the smaller pointed tip spots. The radius face is spherical and so has greater area and mass to withstand deforming a longer time. Further, the weld size will usually be correct, as the contact area is controlled to some extent by the pressure.

2) Tip alignment is simplified since radius faces tend to align themselves.

3) Tip life is longer as more mass at the welding face means lower current density and higher thermal conductivity. It is also more practical to drill deeper water holes in radius-faced tips for more efficient cooling.

4) Weld appearance is better, due to less pick up and the absence of serious surface indentation.

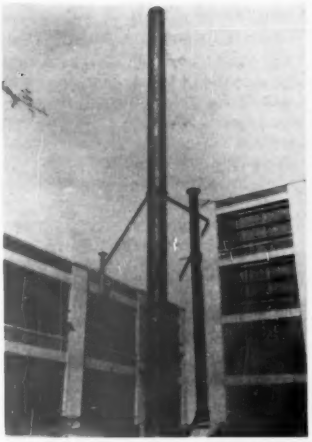
5) Tip dressing, obviously less frequent, is easier.

Proper radius for most shops is usually 2 to 3 in. As with everything else, exceptions are necessary for specific applications.

The Ampco writer makes a telling point when he ends his remarks thus: "As simple proof of our contentions we draw attention to the aircraft industry—where radius-faced tips are almost universally used—and where quality and consistency are high and definite specifications must be met."

* * *

To obtain additional information on any advertised products, use the cards on pages 33-34.



100-Ft Iron Stack Erected in One Day

WORKERS of the C-W Boiler Co., Holliston, Mass., put up a big smokestack for the Farrington Mfg. Co., Boston, in just one day, using prefabricated sections. The stack is 100 ft. high by 4 ft. in diameter and was made of rolled wrought iron plates welded into three cylindrical sections at the C-W Boiler Co. plant.

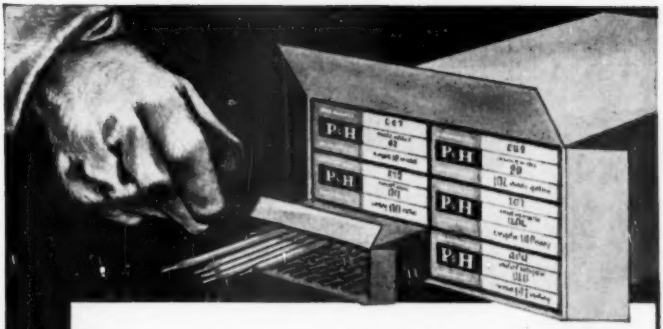
The three sections were trucked to the Farrington plant site and erected by welding. Engineers of the Farrington company selected wrought iron plates to achieve maximum service life for the installation and to protect against corrosive flue gases created by the plant's incinerator and oil-fired heating boiler, according to information received by the A. M. Byers Co.

* * *

Rules Published For Farm Welding Prizes

A BOOKLET containing the rules and conditions for $7,000 in prizes waiting for farm and ranch high school students interested in arc welding is now available. This is the third program for such students sponsored by the James F. Lincoln Arc Welding Foundation, Cleveland 17, where students should write for rules booklets.

For the best descriptions of how arc welding is or can be used in making and repairing farm equipment and tools, there are 100 cash awards totaling $5,000. Awards can go to individuals or a group of students. Ten awards, totaling $2,000 are also made to schools for the improvement of shop mechanics courses. All high school students living on farms and ranches are eligible to compete.



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2. **5 lbs. AC-1, 5/32"** — For mild steels. The most universal electrode yet developed. Unusually easy to handle in any position, with good penetration. AC or DC.
3. **5 lbs. 70LA2, 5/32"** — For welding high-carbon, alloy, high-sulfur, free-machining, cold-rolled, and other hard-to-weld steels. Ideal for steel casting repairs. AC or DC.
4. **1 lb. Horstain, 1/8"** — For spring steels and stainless steels of all kinds. AC or DC.
5. **1 lb. Nicast, 1/8"** — For machinable welds on cast iron. Nicast welds are strong and non-porous.

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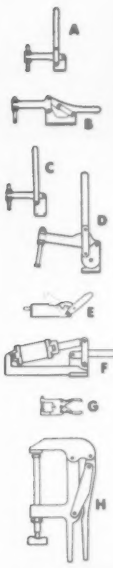

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When a touch on a button moves weldments like these into the correct, most convenient position for a downhand pass, you get more arc time, more welding at lower cost. C-F power operated Positioners rotate the work in a full circle at any point in a range of 135° from the horizontal—giving welders a choice of an infinite number of downhand welding positions instantly.

Every requirement for faster, better positioned welding—constant or variable speed table rotation, full 135° tilt, self-locking gearing which holds the table in any position, oversize built-in main tilt and rotating bearings, choice of two base styles, and many other features—are built into C-F Positioners.

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C-F positioned welds mean better, more economical welds

Compressed Air Institute Wins Distinguished Award

THE Award of Merit has been presented to the Compressed Air and Gas Institute for its excellent services to its industry and for its education program centered in the schools of engineering and the trade press. The honor is given by the American Trade Association Executives of Washington, D. C.

The Institute's award-winning public relations program was launched in 1941 and has consisted of about 50 case-history articles published annually in leading trade journals, the publication of "Compressed Air Handbook" in 1947 and a series of engineering teaching aids consisting of films, lectures, reference pamphlets and surveys since 1947. The continuing program is developed by two committees of the Institute in collaboration with Edmond C. Powers, director of public relations of The Griswold-Eshleman Co., Cleveland, who has served as educational director of the Institute since 1941.

• • •

IAA Prints Booklet For Film-Viewers

AN attractive 12-page pamphlet has been issued by The International Acetylene Association to accompany the presentation of its famous film "Oxyacetylene Flame—Master of Metals." The booklet enables program chairmen unfamiliar with oxyacetylene matters to introduce the film and to discuss it.

A copy of the booklet will accompany the IAA film each time a print is loaned by the Bureau of Mines or the National Film Board of Canada. Additional copies in moderate quantities will be supplied gratis to any member of IAA and to any non-member who has purchased a print of the film.

• • •

$200,000 Investment Pays Big Returns for U. S.

A COMPARATIVELY small U. S. investment of $200,000 has considerably boosted chromite production in Turkey. The Mutual Security Agency estimates that shipments of this essential raw material to the U. S. will reach and possibly go over the 400,000 ton mark and still leave another 150,000 tons for Atlantic Pact nations.

The money came from Marshall Plan dollars and allied funds, and is responsible for an increase of 200,000 tons over 1950 production figures. It was spent to introduce modern mining methods and equipment. The Turkish economy has been helped by more than $5,500,000.

Scaife Company Marks 150 Years in Metalworking

A brief program scheduled for Nov. 20 formally opened the new Scaife Company office building in Oakmont, Pa., and also marked the 150th anniversary of the company. Scaife is the oldest manufacturing firm in the country west of the Allegheny mountains. An open house for employees and their families was planned for the day, according to Alan M. Scaife, board chairman of the steel-fabricating company which has grown in father-and-son tradition through five generations.

Founder of the company was Jeffery Scaife, an industrious young maker of tinware in 1802—when Pittsburgh was a little outpost of jerry-built cabins and mud streets, barely free of Indian raids.

Throughout its long life Scaife has engaged in metal fabricating. It pioneered the familiar household range boiler many decades ago. In recent years Scaife has demonstrated leadership in the development and production of pressure vessels and drawn shapes including cylinders for liquefied petroleum, refrigerant and acetylene gases, tanks for compressed air, water storage and other types of tanks.

During the War of 1812, the Civil War, World Wars I and II, Scaife has turned out such varied items as tar and sponge buckets, cantle plates for cavalry saddles, flame thrower tanks and 4.2 in. chemical mortar shells. Nowadays, Scaife is making high-explosive mortar shells and is fabricating armor plate for tanks.

* * *

New P&H Distributor For West Virginia

WEST VIRGINIA Supply & Equipment Co., 422 N. Fifth St., Clarksburg, W. Va., will handle the complete line of P&H arc welders, electrodes and welding positioners. This company is one of the oldest and best known in West Virginia and will maintain a complete stock of welding equipment and provide technical service for all its welding customers. Harnischfeger Corp., Milwaukee, manufacturers P&H equipment.

* * *

Koldweld Products Purchased by Shenango

THE Shenango Agaloy Tool Co., Sharon, Pa., has bought Koldweld Products, Inc., which will be operated as a wholly owned subsidiary. Koldweld specializes in the cold pressure welding of aluminum tubing. President of Shenango is Don V. Sawhill.

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A GB SILVER BRAZING
ALLOY AND FLUX
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NO MATTER HOW YOU HEAT...
The method of heating for low temperature brazing is a decided factor in the selection of the right silver solder and flux. Specify GB and you're right, because you'll get a combination that was made to work right!
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CHARCOAL
BLOW PIPE
GB's line of six standard silver solders offers a range which meets standard production methods. When special solders are required, GB's Technical Service Division offers assistance which is based on experience in alloying and refining precious metals that goes back more than 80 years.
GB Standard Silver Solders
GB No. 50 Silver Solder, melting range 1160-1175°F
GB No. 50N Silver Solder, melting range 1240-1260°F
GB No. 45 Silver Solder, melting range 1125-1145°F
GB No. 41 Silver Solder, melting range 1125-1160°F
GB No. 35 Silver Solder, melting range 1130-1270°F
GB No. 31 Silver Solder, melting range 1130-1300°F
GB FLUXES
The physical properties and appearance of a brazed joint are controlled to a large degree by the flux which is used. For this reason it will pay you to team-up GB Flux with GB Silver Solder—they were developed to produce maximum results when used together.
GB DATA BOOK
Here's real factual data on all of the important phases of low temperature brazing. You can get a free copy from your GB Distributor — Write us and a copy will be forwarded to you.
GOLDSMITH BROS. SMELTING AND REFINING CO.
1304 W. 59th Street, Chicago 36, Illinois
Suppliers of Precious Metals to Industry Since 1867

for dependable
PERFORMANCE

"FLUXINE" Fluxes are the result of over fifty years of scientific research into the metal-joining field. There are 25 FLUXINE Fluxes . . . one for every welding, silver soldering, brazing, and soft soldering operation . . . each with its own properties, designed for a particular metal-joining operation. All have been perfected not only for highest efficiency, speed, and long life, but for economy and safety as well. FLUXINE Fluxes produce no injurious fumes to irritate eyes or nose of the operator.

Write on your company letterhead for a generous sample stating which FLUXINE Flux you desire.

KREMBS & COMPANY
(Est. 1875)

Dept. J, 669 W. Ohio St., Chicago 10, Ill.

No. 4 FLUXINE, in powder form, for welding cast iron with bronze rods.

No. 7 FLUXINE for welding all types of aluminum.

No. 18C FLUXINE for gas welding of stainless steels and inconel and nickel chrome alloys.

No. 41 FLUXINE used with high-melting silver solders on copper and its alloys and on steel.

No. 42 FLUXINE used with Westinghouse Phos-Copper rods and low-melting silver solders on copper and its alloys.

No. 43 FLUXINE . . . non-glaring . . . used when low-melting silver solders are specified. No injurious fumes. Goes further than most fluxes.

FLUXINE
TRADE MARK REGISTERED U. S. PAT. OFF.

FLUXES TO JOIN ALL METALS

Power to Fit the Machine *

WISCONSIN-Powered
General Electric Welder

Power to Fit the Job

Keeping snow removal equipment on the job often calls for on-the-spot repairs, handled here by a General Electric trailer-mounted WD-4200 welder. Power is provided by a V-type 4-cylinder Wisconsin Heavy-Duty Air-Cooled Engine.

Engineering know-how and practical design of Wisconsin Engines make their choice a logical one for manufacturers building 3 to 30 horsepower equipment. Only Wisconsin Engines offer a choice of 11 different single-cylinder, 2-cylinder and V-type 4-cylinder models, 3 to 30 hp. Only Wisconsin Engines offer tapered roller bearings at both ends of the crankshaft, taking up *all* thrusts. In addition, Wisconsin Engines offer an OUTSIDE magneto with impulse coupling for quick starts, steady running. And, of course, fool-proof air-cooling eliminates cooling problems.

Write today for complete information about all models.

* Powered by V-type 4-cylinder Wisconsin Engine.

WISCONSIN MOTOR CORPORATION
World's Largest Builders of Heavy-Duty Air-Cooled Engines
MILWAUKEE 46, WISCONSIN

Automatic Lead Cladding at Metal Show

KNAPP Mills, Inc., exhibited an improved model of an automatic lead cladding and welding machine at the Metal Show in Philadelphia, Oct. 20-24. The machine will clad a 3½-in. wide band of lead at a regulated rate of speed.

Purpose of the machine is to produce lead clad steel and lead clad copper for strength-corrosion and corrosion-heat transfer applications, respectively.

* * *

Chrome and Glass Protect Moly at High Heat

HEAT-resistant coatings for molybdenum are being investigated because that metal's high melting point (4,750 F) makes it an attractive possibility for jet engines. Fly in the ointment is the tendency of molybdenum to oxidize rapidly at high temperatures.

Studies at the National Bureau of Standards show that a protective coating composed of chromium and frit (glass) greatly extended the life of molybdenum at high heats. Various chromium-frit coatings were bonded to molybdenum specimens, then subjected to oxidation tests under tension in the range 1,500 to 1,800 F and to flame tests in the range 2,000 to 3,000 F. At 2,800 F, with no applied load, protection for as much as 7 hours was attained, a long enough period to be useful for some applications.

The investigation was conducted by D. G. Moore and associates of the NBS enameled metals laboratory, under NACA sponsorship. This study is reported in detail in "Study of Chromium-Frit-Type Coatings for High-Temperature Protection of Molybdenum," by Moore, Bolz, Pitts and Harrison, NACA Technical Note 2422 (July 1951).

* * *

"NEW INVENTION OF MINE — WELDING CLAMP THAT ALSO ELIMINATES BACK-SEAT DRIVING."

Ingenious
New SMITH
"FLO-TROL"
eliminates
seat burn-out
NO MORE BURNED OUT CUTTING VALVE SEATS
NO MORE COSTLY DELAYS
Spring-loaded diaphragm prevents reverse flow of acetylene, protects torch against back-fire and burned out seats
Special new design permits rotating welding tip in any direction even while flame is burning!
No WRENCH needed. Finger-tip pressure on nut makes gas-tight seal.
Seal rings keep gases separated until they reach proper place for mixing.
Flexible insert in back-end of cutting assembly prevents leakage of high pressure oxygen.
CARELESS OR INEXPERIENCED OPERATORS CANNOT HARM SEAT IN THIS NEW SMITH TORCH!

"FLO-TROL," an exclusive Smith feature, absolutely prevents reverse flow of acetylene to cutting valve seat area, thus eliminating danger of pre-mixing and pre-ignition. You can't go wrong. It's fool-proof. Take advantage of this technical achievement to reduce maintenance costs and eliminate production delays. This new Smith Torch with built-in protection really stays on the job . . . keeps production schedules rolling.

Equipment illustrated is Smith's LIFELONG Welding Torch Body with LIFELONG Cutting Assembly: Rugged and full size for general repair maintenance and manufacturing. Complete line of welding tips and special purpose tips is available with this model.

Smith's MIDLINE Welding & Cutting Equipment

Medium size and medium weight. Designed for production work and garage trade.

Smith's AIRLINE Welding & Cutting Equipment

Feather weight and small size. Ideal for light production, aircraft, body and fender work.

Smith's "FLO-TROL" also protects these two models.

SMITH WELDING EQUIPMENT CORPORATION

Manufacturers of fine Welding Equipment for over 40 Years

SMITH WELDING EQUIPMENT CORP.

2635 S.E. 4th, Minneapolis, Minn. WE-24

Please send me more information on the time-saving and money-saving features of your new torch.

Name_____

Address_____

City_____ State_____

BOOK REVIEWS

Welding Storage Tanks

STANDARD RULES FOR FIELD WELDING OF STEEL STORAGE TANKS. Published by the American Welding Society, New York, 1952. Paper, 6 x 9 in., 23 pages. Price 50c.

The new 1952 edition of the AWS standards for steel storage tanks includes for the first time provisions for automatically welding liquid storage tanks whose contents don't exert over 15 psi gage pressure. The 1947 rules have been considerably changed in the matter of qualification of welding procedures and weldors. Provision is made for the use of low-hydrogen electrodes for manual arc welding. Generally, all requirements for manual arc welding were reviewed and are now completely up to date.

* * *

Metallurgy

METALLURGY FOR ENGINEERS. By John Wulff, Howard F. Taylor and Amos J. Shaler. Published by John Wiley & Sons, New York, 1952. Cloth 5½ x 8½ in., 624 pages. Price $6.75.

Five years in the writing, this new book is based on the three authors' experience in teaching metallurgy at Massachusetts Institute of Technology. It is a textbook for engineering students and can also be used handily by practicing engineers who wish to review or increase their stock of such information.

Differing from many metallurgy books, this text represents a very real attempt to keep the language plain, the illustrations simple and the ideas lucid. There have been included only principles required for understanding the basic transformations of metals in welding, casting and metalworking.

The first 14 chapters of the book are concerned with the principles of metallurgy while the latter 15 cover processing practices. Welding is discussed in five chapters covering the major arc, resistance and gas processes, thermit welding, metallizing, brazing and soldering. In all, 70 pages are devoted to the subject.

Distinguishing *Metallurgy for Engineers* from the usual metallurgy book, each chapter ends with a summary of the important points, a list of definitions, terms and concepts and a group of questions to test the reader's understanding. Also placed here are references of easily obtainable books for more information on topics only briefly considered in the text.

National
Carbide
EFFICIENT
ECONOMICAL
DEPENDABLE
for
Welding & Cutting
SPECIFY

NATIONAL CARBIDE IN THE RED DRUM
Write us for information as to nearest available stock.
NATIONAL CARBIDE COMPANY
A Division of Air Reduction Company, Inc.
60 E. 42nd St., New York 17, N. Y.

1 2 3 4
90° ANGLE
75° ANGLE
45° ANGLE
STRAIGHT
FOUR HEADED MECO TORCH...
QUADRUPLES CUTTING USES.
Four different angle heads give the MECO Super Cutmaster the amazing flexibility to handle any cutting job. This four-in-one torch is used by leading American industries for heaviest hand cutting and general service. Pre-heat flame stability assured by spring tension control valves. Easy-to-open cutting valve is adjusted by touch to provide correct amount of oxygen for the job.
Various mixer designs use either pressure or low pressure Acetylene, low pressure City Gas, Butane, Propane, or Hydrogen.

The tougher the job—the sooner you'll specify Super Cutmaster to your MECO dealer.
Meco
Modern Engineering CO., Inc.
3411 PINE BLVD. ST. LOUIS 3, MO.

High Speed Steels

HIGH SPEED STEELS AND THEIR HEAT TREATMENT. By Willi Haufe. Published by Carl Hanser Verlag, Munich 27, Germany, 1951. Cloth, 6 x 8¼ in., 276 pages. Price $3.75.

Written in German, this book deals not only with high-tungsten, high-speed steels but also steel of lower tungsten content, i.e. 14%. While much of the book deals with the influence of alloying elements, the author covers heat treatment extensively. Many suggestions are given for the conservation, fabrication and protection of high-speed steels by soldering and welding. Excellent hints are provided on the testing of high speed steels as well as rules for the proper procedures during heat treatment. Included are application data for various cutting jobs.

* * *

Pipeline Corrosion

A MANUAL ON UNDERGROUND CORROSION. Published by Columbia Gas System Service Corp., Columbus 15, Ohio, 1952. Paper, 8½ x 11 in., 37 pages. Price 75c.

Since the Columbia Gas System operates approximately 33,000 miles of underground pipeline, it has issued this manual to give its personnel a better understanding of the corrosion problem.

Starting off the manual is a simple explanation and illustration of a galvanic cell. Remainder of the text is technically sound and clearly illustrated with 52 drawings.

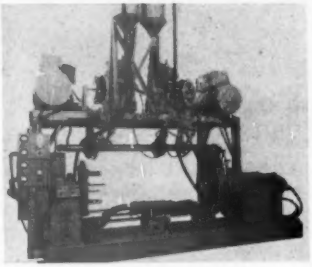
* * *

Metallizing

RECOMMENDED PRACTICES FOR METALLIZING: Part 1B—Application of Aluminum and Zinc for Protection of Iron and Steel. Published by the American Welding Society, New York, 1952. Paper, 6 x 9 in., 10 pages. Price 50c.

Issued on the basis of considerable field experience this pamphlet tells how aluminum and zinc are best applied by metallizing for the protection of iron and steel structures. Suggestions for amounts and types of either metal to be used are also provided.

Covered in detail are the following: materials and equipment; techniques of blasting and spraying and inspection procedures for verifying the efficiency of the coating. Organic coatings over the metallized surfaces for additional protection are also discussed. Final section of the standard gives typical coatings for various exposures such as ordinary atmospheres, salt, industrial, farm and a combination of fresh and salt water.



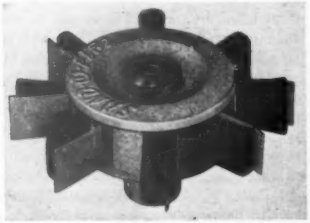
Tank Welding Fixture

267 OUTSTANDING feature of a new process and girth welding fixture is a built-in 5-ton hydraulic press for the precision positioning of components prior to welding. A stationary headstock supports the center spindle drive and gives reaction to the press while the adjustable tailstock houses the hydraulic press cylinder. The press is under push button inching control. Ejecting and reloading are automatic. Manual longitudinal and radial positioning of the two submerged-arc welding heads is provided to cover the machine range. Note the flux-recovery system mounted on each head.

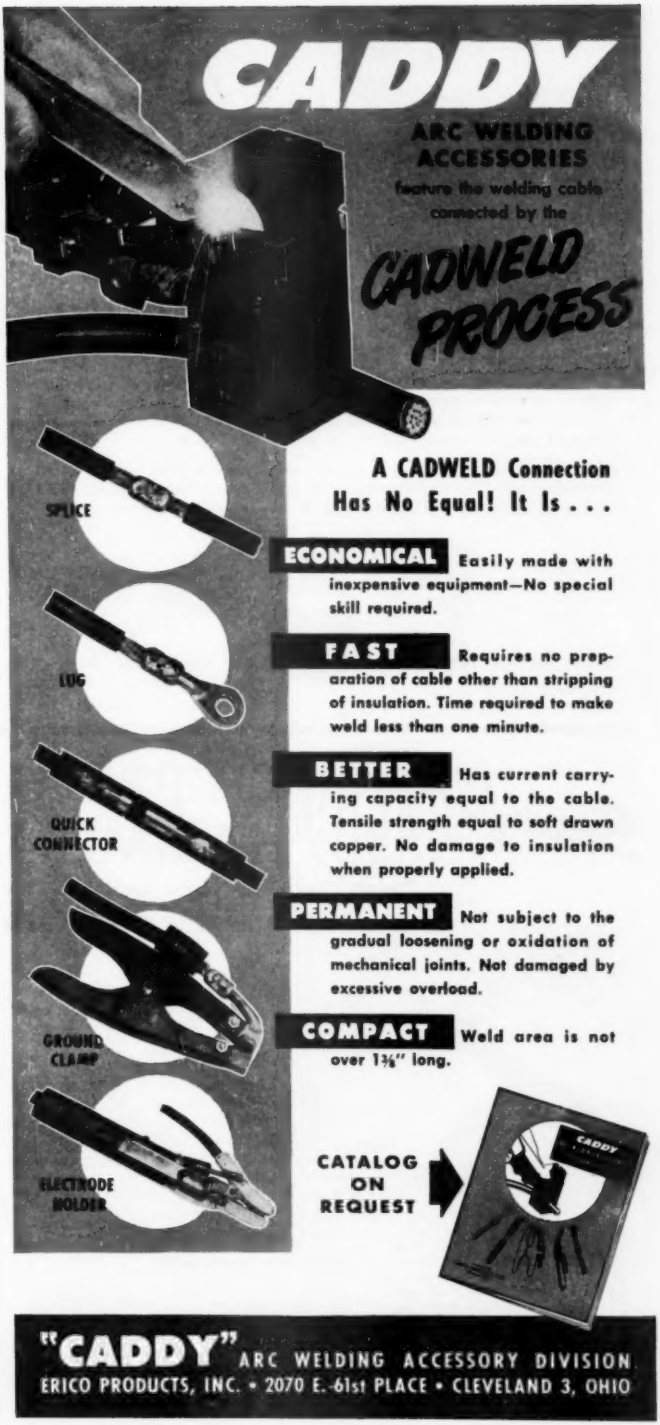
For changing to different diameters of tanks, less than ½ hour is required. The machine will produce tanks having diameters from 9 to 24 in., 12 to 36 in. or 18 to 48 in. and up to 96 in. long.

MORTON MFG. CO., Muskegon Heights, Mich.

* * *



268 **FLEXIBLE cleaning wheel uses both abrasive strips and brushes. It's said to deburr, polish, remove tool marks, rust and scale on metal with high efficiency. The cushioning bristles force the abrasive strips into, around and over corners, hollow and fluted. An indexing knob feeds out fresh abrasive paper from the center of the wheel where a special cartridge of abrasive is sorted. Its use is recommended highly for both flexible shaft and portable tools. Merit Products, Inc., Culver City, Calif.**


CADDY
ARC WELDING ACCESSORIES
feature the welding cable connected by the
CADWELD PROCESS
A CADWELD Connection Has No Equal! It Is . . .
SPLICE
LUG
QUICK CONNECTOR
GROUND CLAMP
ELECTRODE HOLDER
ECONOMICAL Easily made with inexpensive equipment—No special skill required.
FAST Requires no preparation of cable other than stripping of insulation. Time required to make weld less than one minute.
BETTER Has current carrying capacity equal to the cable. Tensile strength equal to soft drawn copper. No damage to insulation when properly applied.
PERMANENT Not subject to the gradual loosening or oxidation of mechanical joints. Not damaged by excessive overload.
COMPACT Weld area is not over 1⅜" long.
CATALOG ON REQUEST
CADDY
"CADDY" ARC WELDING ACCESSORY DIVISION
ERICO PRODUCTS, INC. • 2070 E. 61st PLACE • CLEVELAND 3, OHIO

HOW TO DUCK THE WELD-SPATTER PROBLEM

Use Protect-O-Metal and weld spatter wipes off as easily as water from a duck's back! With Protect-O-Metal you speed welding and save up to 85% of weld cleaning time and labor. Brush or spray P. O. M. in weld seam and on adjacent metal—weld—then brush off spatter in seconds.

Just a little P. O. M. goes a long way too—costs less than 1/10c per foot of weld protected, saves up to three times its cost in time savings alone. Order a trial gallon ($3.25), satisfaction guaranteed or invoice will be cancelled.

PROTECT-O-METAL
POM
GWSMITH

G. W. SMITH & SONS, INC. 5407 KEMP ROAD, DAYTON, O.

Specify CMD CHIPPING HAMMERS
—The Finest Tools Made for EVERY Weld Cleaning Need

TYPE CB . . . A favorite for many years, this hammer is 3 tools in 1—drift, chisel, and removable wire brush.

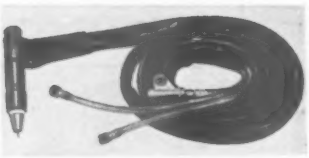
TYPE A . . . Drift and chisel of high-grade steel. Popular in malleable and grey iron foundries.

TYPES EB and FB . . . models E and F can be supplied with brush as shown here. Brush can be replaced.

TYPE E . . . head of high-grade steel has drift and chisel. Special hand grip absorbs shock.

Order from your dealer. Write today for descriptive circular 2-W.

CHICAGO MANUFACTURING & DISTRIBUTING CO.
1928 WEST 46th STREET • CHICAGO 9, ILLINOIS



Rugged I-G Torch

269 DEVELOPED for heavy-duty, machine inert-arc welding, the HW-13 torch is light and can be mounted on any machine carriage that provides proper speed control for straight-line, shape, girth seam or portable welding operations.

Gas leakage and contamination by air are prevented by specially designed gaskets used throughout the torch. Design of the torch minimizes the stub loss of tungsten electrodes.

Newly-designed cooling passages keep the torch in efficient operating condition at all time and yet are easy to clean. Welding nozzles for the torch are replaceable without dismantling the torch.

Body of the torch is covered with a tough plastic.

LINDE AIR PRODUCTS CO., New York City 17.

* * *

Hardening Compound

270 NEW fast-acting steel hardening compound, "Hard-N-Tuff" carburizes, nitrides and chromizes the surfaces of tools and high or low carbon steel parts. Its use is said to eliminate cracking due to decarburization and on low carbon steels to provide a long-lasting surface.

To use, the area to be hardened is first cleaned. The "Hard-N-Tuff" compound and quenching unit are kept close by. The heat is put to the tool or part to the carburizing or heat treating temperature necessary for its analysis of steel. Without allowing the temperature to drop, the object is quickly transferred from the torch flame and buried in "Hard-N-Tuff" powder. It is held there for about 2 minutes. After removal from the powder, the tool is immediately returned to the heating medium and reheated to just below the upper critical temperature. After it is held at this heat until the compound is fused into the metal, the job is completed by quenching the part in oil or brine.

DOUGHTY LABORATORIES, New York City 36.

* * *

More New Products on Page 110

* * *

To obtain additional information on listed new products, use the cards on pages 33-34.

30 YEARS AGO

ELEVEN degree below zero didn't stop about 40 weldors from gathering for a meeting at Spencer, Ia., on Dec. 12. All night before the meeting a sixty-mile-an-hour bitter cold wind swept the countryside, but these men cared enough about welding to make the trip. Main subjects discussed were auto repairs, farm equipment jobs and boiler work.

—30 YEARS AGO—

420-FT sections of railroad rails were recently installed on the interurban lines of the Washington Railway & Electric Co., Washington, D. C. To make one 420-ft length, seven rails were Thermit-welded together. Reason for the extra long lengths was gain in speed of installation.

—30 YEARS AGO—

ARC WELDED repair of the bottom of a 55,000 barrel oil storage tank at El Dorado, Kansas, is reported by the Welding Engineering Co., Bartlesville, Okla. Altogether 2,876 feet of seams were welded and 22,936 rivet holes plugged with weld metal. About 1,100 lb of rod were burned up.

—30 YEARS AGO—

WILSON Welder & Metals Co. has just completed a repeat order for welding machines for the Polish State Railways, making a total of 13 welders supplied to this railroad.

—30 YEARS AGO—

"FAITH will move mountains"—a regular church-going weldor writes us that on one job he was the 25th man employed to make a difficult weld-repair. No less than 24 men had failed before him, but the owner still had faith enough to try it again.

—30 YEARS AGO—

SIX EGYPTIAN welding students, all college graduates, are in the United States to study welding and other automobile repair courses at the Michigan State Automobile School, Detroit. The U. S. Dept. of Commerce, of which Herbert Hoover is head, is cooperating with the Egyptian government in securing the proper training for the men's three-year stay in America.

—30 YEARS AGO—

No permanent injury or loss of vision has ever been caused by the welding arc, states C. J. Holslag, chief engineer of the Electric Arc Cutting and Welding Co. He quotes two recognized welding authorities as being in agreement with him: Elihu Thomson, of the Thomson Elecric Welding Co. and W. F. Andrews of General Electric Co.

Meet Government Specifications With

NEW SINGLE PHASE NON-SYNCHRONOUS UP-DOWN SLOPE CONTROL with

Robotron "CUSHIONED POWER" WELDING TIMERS

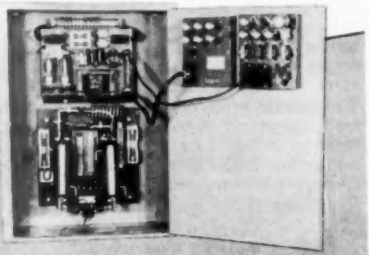
Now . . . with this new concept of Non-Synchronous SINGLE PHASE Control you can weld all types of Brass, Aluminum, Monel Metal, Stainless and Nickel Alloy Steels, Coated or Plated Metals or any combination of Dissimilar Metals and meet U. S. Government Specifications. Welding is accomplished with minimum surface indentation, and electrode pick-up, maximum ductility and constant uniformity. The Robotron Non-Synchronous SINGLE PHASE Control Unit has the simplicity of a single phase circuit instead of the present complicated and difficult-to-maintain multiple circuits.

HI-CONDUCTIVITY
LO-CONDUCTIVITY

Robotron's "Cushioned-Power" welding cycle begins with a PREHEAT, or up slope, stage that assures proper seating of electrodes, cutting down surface resistance and increasing WELD heat where it's needed. It also decreases surface indentation, spewing of metal and lengthens the life of the electrodes. The TEMPER stage, or down slope (Trailing Current), controls rate of heat flow into the surrounding metal after weld is over, definitely controlling brittleness and in case of Coated Metals, allows coating or plating to resurface the weld.

Non-Synchronous "UP-DOWN" Slope Welding Control Unit is the least expensive unit on the market today, and it still assures better welds under a greater variety of welding conditions.

And best of all . . . Robotron's well-known plug-in feature gives you quick, easy installation and maintenance, plus complete versatility and adaptability in operation.



W361-H3C4
NEMA 3B WITH "UP-DOWN" SLOPE CONTROL —600 AMP. IGNITRON CONTACTOR AND SIZE "B" IGNITRON TUBES

THE FINEST IN INDUSTRIAL ELECTRONICS

Ask about our on-the-job approval plan. (NO OBLIGATION)

Robotron* CORP..

21300 W. Eight Mile Rd., Detroit 19, Mich.

3603 *T. M. Registered

Cut Your Gas Bill Up To ONE-HALF!

PILOT-LIGHT FLAME

- Saves gas . . . saves time
- Full "pre-set" heat instantly
- No re-adjustment
- No re-lighting

MARQUETTE
REG. IN U. S. PAT. OFFICE

MODEL H
INSTANT HEAT AUTOMATIC Welding Torch

With Marquette's new "Instant Heat" automatic torch, you light once, adjust once . . . and let the pilot light burn between welds. Press the lever . . . you get full flame instantly. Release it, and it cuts automatically to a tiny pilot flame, saving up to one-half on gas. Marquette's Instant Heat Automatic Torch is a precision-made instrument, embodying such features as "O"-Ring seals, full tip swivel, stainless steel heat barrier. Write for complete information.

MARQUETTE
REG. IN U. S. PAT. OFFICE

Welding & Automotive Service Equipment

MARQUETTE MANUFACTURING CO., INC.
307 E. Hennepin Avenue • Minneapolis 14, Minnesota

About People

HARRY DAY has been appointed vice-president and general manager of Link Welder Corp., Detroit. He has been general foreman of Wayne Die and Tool Co., chief engineer for Multi-Hydromatic Welding and Mfg. Co. On joining Link Welder as chief engineer, he subsequently became plant manager, then assumed the position of general manager. He is a graduate of Lawrence Institute of Technology.

* * *

ROBERT BOSS has been appointed regional manager for All-State Welding Alloys Co., Inc., to cover all of Ohio, the western parts of New York and Pennsylvania. He has been in the welding field since 1936, except for three years in the army air force. Previous to joining All-State he was a representative for Jackson Welding Supply Co., Rochester, N. Y. He has been a member of the executive committee of the Rochester section of AWS for two years.

* * *

CARL E. JOHNSON, a veteran of 19 years' service as engineer at Scaife Co., Oakmont, Pa., has been appointed chief engineer. E. T. ROBBELOTH will continue as executive engineer and WALKER N. GREEN as plant engineer. JAMES S. SHUSTER was appointed product engineer for the pressure vessel division. Mr. Johnson is a registered professional engineer, a member of ASME, AWS and several other technical societies. He is a member of the brazing committee of AWS.

* * *

DR. E. C. BAIN, vice-president of research and technology of United States Steel Co., has been awarded the highest honor of the leading metallurgical society of France, La Societe Francaise de Metallurgie. Dr. Bain is the first American to receive the Grand Medal, which has been awarded only six times previously.

* * *

R. D. WASSERMAN, president of Eutectic Welding Alloys Corp., Flushing, N. Y., has been elected to membership in the Young Presidents' Organization. To be a member one must have become president by 39 years of age of an industrial or service corporation doing a minimum of $1,000,000 gross business annually, as well as fulfilling other qualifications.

SPECIAL GLOVE DEVELOPMENT BY RACINE

THREE STYLES

- 380 Horsehide
- 384 Pearl Carpincho (wildpig)
- 386 Cowhide

Chrome tanned Heat Resistant Split Leather—Heat Breaker Back Lining—LARGE size—

1 One piece back.
2 One piece palm.
3 Thumb seam protected by wide leather strap.
4 All vulnerable seams welted.
5 Palm side of thumb is protected by extra leather overlay.

• Send for booklet on these and other GARDSMEN Protective Equipment.

RACINE GLOVE COMPANY, INC.
RIO, WISCONSIN

HITCH on to these

Model 1-B
Now only $4.95 Post Paid (when paid in advance)

Sell-on-sight Bull Dog Hitches . . . the ball and socket coupler that can't let go. Heavy drop forge steel construction for trailers up to 2500 pounds. Shank diameter—1⅜". Fits 1¼" pipe tongue.

AXLE ASSEMBLIES

Model 1UCO
$65.29 Less Tires
F.O.B. Factory

for quicker sales! Farm-proved strength. Best built for farm implements, wagons—trailers of every kind. Includes everything except tires. Either 15" or 16" wheels.

JACK—satisfied customers bring in others. Bull Dog Jacks make easy, one-man job of parking or hitching trailers—farm implements. All steel. Heavy duty, ball-bearing swivel action. "Can't lose" crank. Complete with brackets, ready to install.

Model 60-F
Only $15.75 Post Paid (when paid in advance)

Write today for descriptive folders and price sheets. Substantial, worth-while discounts to established shops.

Hammer Blow Tool Company
Wausau 19 L, Wisconsin

A. E. ZEISEL, president of Permalatem Welding Alloys, Inc., Red Bank, N. J. will take over distribution and sales promotion east of the Mississippi and in Canada for Mir-O-Col Alloys Co., Trindl Products Ltd., York Engineering Co. and Pacific Welding Alloys Co. He has formed a new company, A. E. Zeisel and Associates, to sell and service the hard-facing alloys, welders, fluxes and welding alloys of the above firms. The products will be sold in conjunction with Permalatem low-heat alloys through welding supply distributors.

* * *

BILL LANGFORD and BILL HARTFIEL will sell high and low pressure air and hydraulic cylinders made by Hanna Engineering Works in the Minnesota and northwestern Wisconsin areas. They work for Haldeman-Langford, St. Paul 4, new representatives of Hanna. JOE SHAFFER of Scott Equipment & Engineering Co., Indianapolis 8, will handle Hanna sales in central and southern Indiana and northern Kentucky.

* * *

HENRY L. HOFFMAN, formerly welding engineer at International Harvester's manufacturing research laboratories is now welding engineer with Daystrom Instrument Division, Archbald, Pa.

* * *

GEORGE A. PARK, Norton Company's sales manager, eastern region, has been appointed manager of distributor sales. The eastern and central sales regions will be combined under DONALD L. PRICE as sales manager, eastern region.

* * *

J. I. BANASH, consulting engineer for the International Acetylene Association, was awarded a life membership in the American Society of Safety Engineers in June. In recognition of his long and distinguished career in safety, the award was presented by CHARLES F. ALEXANDER, director of industrial safety of the National Safety Council.

* * *

LEONARD B. ALLEN, formerly manager of quality control, has been named assistant plant manager of Solar Aircraft Co.'s San Diego plant. A graduate of the University of Oklahoma, Mr. Allen joined Solar in 1938.

The U. S. Steel Supply team

that gives you

personalized service

These people *specialize* in good steel service!

GOOD STEEL SERVICE is much more than a one-man job . . . it requires teamwork between specialists. Each of our warehouses has such a team ready to go to work to give you fast, trouble-free service.

Your U. S. Steel Supply salesman will put the members of this team to work for you. Call him for steel, tools, equipment, machinery, advice on the selection of the right type of steel, or assistance on production techniques with special steels. United States Steel Supply is a "one call" source of steel supply service . . . one call to our salesman puts an expert team to work to see that you get what you want—where you want it—when you want it.

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HEADQUARTERS: 208 So. LA SALLE ST., CHICAGO 4, ILL. · WAREHOUSES COAST-TO-COAST
Warehouses and Sales Offices: BALTIMORE · BOSTON · CHICAGO · CLEVELAND · LOS ANGELES · MILWAUKEE
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SAN FRANCISCO · SEATTLE
Sales Offices: INDIANAPOLIS · KANSAS CITY, MO. · PHILADELPHIA · PHOENIX
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UNITED STATES STEEL

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the amazing Crayons that tell temperatures

A simple method of controlling working temperatures in:

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- TEMPERING
- FORGING
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- HEAT-TREATING IN GENERAL

It's this simple. Select the Tempilstik° for the working temperature you want. Mark your workpiece with it. When the Tempilstik° mark melts, the specified temperature has been reached.

$2 each gives up to 2000 readings

Available in these temperatures (°F)

113	263	400	950	1500
125	275	450	1000	1550
138	288	500	1050	1600
150	300	550	1100	1650
163	313	600	1150	1700
175	325	650	1200	1750
200	338	700	1250	1800
213	350	750	1300	1850
225	363	800	1350	1900
238	375	850	1400	1950
250	388	900	1450	2000

Also available in pellet or liquid form

FREE —Tempil° "Basic Guide to Ferrous Metallurgy" — 16¼" by 21" plastic-laminated wall chart in color. Send for sample pellets, stating temperature of interest to you.

Tempil° corp.
11 WEST 25th STREET

ROY A. NOBLE has been appointed supervisor of extruded and stainless products sales for the National Tube Division of United States Steel Co.

* * *

ALEX OLEAIR has been named field engineer in charge of a new office at 710 West 21st St., Norfolk, Va., opened by Nelson Stud Welding, Div. of Gregory Industries, Inc. He has been with Nelson since 1947.

* * *

NORMAN J. MCLEOD has been elected president and general manager of Safety Clothing and Equipment Co., Cleveland. He has been vice-president in charge of sales promotion and advertising of the Royal Vacuum Cleaner Co. EARL BROOKS, former president, becomes chairman of the board. L. F. BROOKS remains as vice-president and LEE DEBES as sales manager.

* * *

R. L. LLOYD has been appointed general manager of advertising and R. A. WHEELER, assistant general manager of advertising of The International Nickel Co., Inc. M. J. PHILLIPS has been named assistant to the general manager of advertising and H. S. LEWIS and A. P. MORE assistant managers of advertising. Mr. Lloyd has been with International Nickel since 1923 and was manager of the Inco Nickel Alloys Department's advertising section since 1934.

* * *

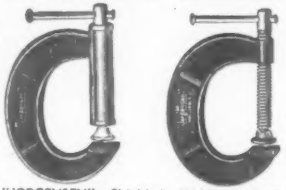
Died . . .

FRED H. HAGGERSON, chairman of the board of Union Carbide and Carbon Corp., died in New York Oct. 14 after a short illness. He was 68 years old and had been with Union Carbide for 33 years. Mr. Haggerson was made a vice-president of the corporation in 1938, a director in 1941 and president and a member of the executive committee in 1944. He was awarded the 1949 Medal for the Advancement of Research presented by the American Society for Metals for his backing of industrial research metallurgy, steelmaking materials, welding methods and the uses of oxygen and acetylene.

* * *

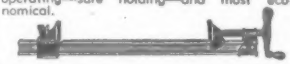
E. B. SHERWIN, president of the Chicago Hardware Foundry Co., North Chicago, Ill., died Oct. 10 at the age of 63. He graduated from Lewis Institute, Chicago, in 1910 and spent his entire business career at family business. He was a member and officer of the Gray Iron Foundry Association, National Foundrymen's Society, the Gray-Iron Research Institute, Industry Advisory Committee of NPA, and

"Jorgensen" and "Pony" CLAMPS for WELDERS:



"JORGENSEN" Shielded Welders' Clamps eliminate damage from "spatter", and are low-priced. "Regular" "C" clamps are available too, if preferred.

"PONY" Clamp Fixtures make ideal bar clamps on any length of black pipe. Fast operating—sure holding—and most economical.



"JORGENSEN" Steel Bar Clamps are designed for the severe requirements of welding service; exclusive "multiple disc clutch" makes for instant adjustment—economy. The trade-mark "JORGENSEN" or "PONY" on your clamps is assurance of utmost satisfaction in service—specify and insist upon them from your supplier. FREE CATALOG ON REQUEST.

ADJUSTABLE CLAMP COMPANY
"The Clamp Folks"
426 N. Ashland Ave., Chicago 22, Ill.

W-AL-CO RODS

for Welding of ALUMINUM

ELECTRIC AND GAS WELDING

Drawn Wire
TYPES 25, 43 and 52
Brazing 718

Aluminum Solder
White Metal

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744 Broad St. Newark 2, N. J.

BUY

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SHAWINIGAN CARBIDE

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EMPIRE STATE BUILDING

NEW YORK 1, N. Y.

the Illinois Manufacturer's Association. His brother Ray F. Sherwin, continues as manager of the welding rod division, one of the earliest manufacturers of cast iron rods.

* * *

JUSTIN G. SHOLES, 81, passed away on Oct. 28. He was a charter member of the executive board of the Compressed Gas Association. Mr. Sholes organized the Ohio Chemical and Mfg. Co., one of the oldest members of the association.

* * *

FRANK G. TALLMAN, JR., recently passed away. He was president of the Compressed Gas Association during the year 1941. He was employed with E. I. du Pont de Nemours & Co.

* * *

MATHIAS L. EDER, founder and president of Canton Alloys, Inc., Canton, O., passed away Dec. 12, 1951, at the age of 65. After 13 years service with the Timken Roller Bearing Co. he went with Coast Metals & Reduction, Inc., where he was sales vice-president until June, 1949. An ardent musician, he played in two musical groups in Canton. He was a member of AWS, ASM, American Foundrymen's Association and the Musician's Union.

* * *

new type paste flux

FOR SILVER BRAZING
COPPER, BRASS, BRONZE, STAINLESS, AND OTHER FERROUS AND NON-FERROUS METALS

Always Uniform. Never Cakes. No Mixing.

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Approved under Navy specification S1F4a
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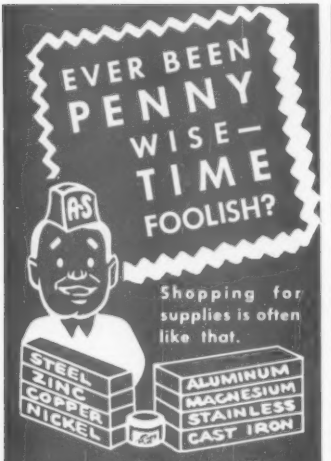
FOR LACK OF CORRECT ADVICE?

A smart golfer goes to the pro when he wants to cure himself of the hooks and slices that ruin his score. Twenty minutes' instruction is all it takes. If you're having difficulties on any welding problem we would like you to think of us as your "pro." We're anxious to help ..in every way we possibly can. That's our business.

Just phone your nearest CHAMPION sales agent or distributor . . . let him offer some professional advice on your welding procedures. Of course there is no cost or obligation.

THE CHAMPION RIVET CO.

CLEVELAND, OHIO • East Chicago, Ind.



Now is the time to investigate the important services your nearby All-State Distributor offers.

1. ONE SOURCE OF SUPPLY

It makes sense to make your A-S Distributor and All-State your one proven source for all alloys and fluxes needed for welding, brazing, soldering, tinning and cutting.

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A-S Distributors stock a large variety of things you have to have quickly when you want them. They're competitive on price — usually lower if your eye is on the job costs. That comes of their handling All-State Alloys and Fluxes for all metals. They do better jobs for less.

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Each All-State Distributor has men especially qualified by training and experience to aid in the proper selection and use of alloys and fluxes for jobs where you might need help. Back of them, and always ready to pitch in on the problem jobs are the All-State regional men and the well-known All-State technical service facilities at White Plains, N. Y.

4. FREE LITERATURE

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A-S DISTRIBUTORS EVERYWHERE

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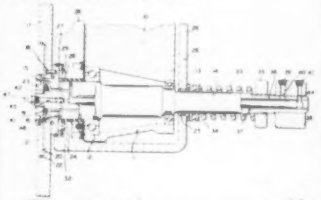
WELDING ALLOYS CO., INC.
White Plains, N. Y.

From the Patent Office

Seam Welding Head

2,614,146. Edwin A. Mallett and Melvin M. Seeloff, Warren, O. Assigned to The Taylor-Winfield Corp., Warren, O. Filed Sept. 19, 1951. Granted Oct. 14, 1952.



This patented apparatus rotatably supports and conducts welding current to a rotary electrode of an electric seam welder. It has a projecting rigid support with a spindle journaled in it and extending outwardly of opposite sides thereof. The improvement comprises a hollow conductor encasing the free end part of the support. It has aligned bores in opposite walls thereof for the reception of parts of the spindle whereby the conductor is floatingly mounted on the spindle for axial movement thereon. There are means for securing a rotary electrode to one end of the spindle comprising a current-conductive adapter ring mounted on the end part of the spindle. It has a flat inner face, a current-conductive ring rigidly mounted on the outer face of an adjacent wall of the conductor and adapted to be brought into pressure contact with the adapter upon movement of the conductor axially along the spindle. Spring means are interposed between the opposite wall of the conductor and the opposite end part of the spindle to urge the conductor axially along the spindle to thereby yieldingly maintain a predetermined pressure engagement between the adapter and the ring.

* * *

Brazing Flux

2,610,933. Louis E. Stark, Grand Island, N. Y. Assigned to Union Carbide and Carbon Corp. Filed Nov. 8, 1949. Granted Sept. 16, 1952.

A newly patented welding and brazing flux consists of 1 to 20% zinc borate, the remainder boric acid and incidental impurities. The flux is substantially free of alkali metal compounds.

SPECIALIZING IN "BETTER-BUILT"

WELDING & SAFETY EQUIPMENT

FOR OVER 25 YEARS

There is a DOCKSON distributor near you. Name on request.

Write for our complete Welding and Safety catalogs.

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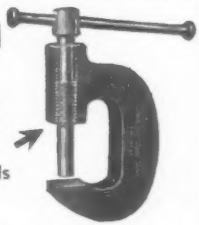
"Red Head"
WELDING CLAMPS



- Designed for Welding
- No Threads To Damage

1. Case Hardened threads are always protected from weld spatter and never exposed to damage in open or closed position.

2. The clamp body is cut from solid plate, thereby insuring extreme rigidity and giving great resistance to bending or twisting.

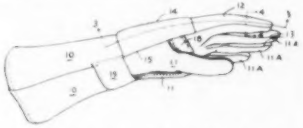
3. Heat treated chrome molybdenum alloy handle offers great resistance to bending.

23 stock sizes

CHICAGO BOILER COMPANY
1969 CLYBOURN AVENUE
CHICAGO 14, ILLINOIS

Weldor's Glove

2,610,326. IRENE E. SABIN, Youngstown, O. Assigned to Sabin Company Gloves, Youngstown, O. Filed April 17, 1950. Granted Sept. 16, 1952.

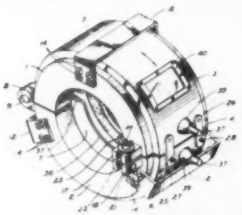


A newly patented weldor's glove comprises the usual back, palm and cuff parts, narrow finger extends on the palm part and a number of relatively wide finger back sections, parts of which are secured on one another and to the sides of the palm part by longitudinal seams. The inturned seams secure the remaining parts of the finger back sections to the narrow finger extensions. A back guard section comprises a piece of material secured on the outer side of the back part of the glove by inturned seams at both sides of the glove and transverse seams at both ends of the guard. These seams overlie the first mentioned longitudinal seams between the finger back sections and with the material loosely overlying the glove back.

* * *

Radiant Heat Welding

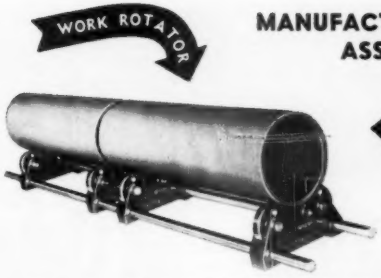
2,611,848. OLIVER ROSS SMITH, Fort Worth, Tex. Filed May 25, 1950. Granted Sept. 23, 1952.



Newly patented equipment for welding pipes includes a cylindrical casing that will fit around the abutting ends of two pipe sections. The casing has semi-circular elements forming side walls that are engageable about the pipe to support the casing. The casing also has semi-cylindrical elements forming a cylindrical wall and interengageable means connectings this wall to the side wall for circumferential movement around the pipe sections. Substantially semi-circular electrodes are carried by the cylindrical wall in radially spaced positions around the weld joint.

* * *

To obtain additional information on any advertised products, use the cards on pages 33-34.



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The new JOHNSON ROTARY ALIGNER is a valuable time and money saver in all work requiring rotation and alignment of stock. Speeds production in repair, welding, manufacturing and assembling departments by eliminating slow expensive set-ups on many miscellaneous jobs.
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621 Menomonie Street EAU CLAIRE, WISCONSIN

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KEEN-ARC CARBONS

Cored and heavily copper coated for twin arc torches.

WELDER BRUSHES

The "right" brush for every type and make of welding equipment.

ELECTRODES and RODS

All standard types and sizes.

PLATES

1/4" thickness and up.

PASTE

Heat resistant, easily molded.

PLATES and PASTE ASSORTMENT

$24.50
A handy assortment, developed especially for welding departments or small welding shops.

COMPLETE BECKER ENGINEERING SERVICE
is always available and entails no obligation whatever.

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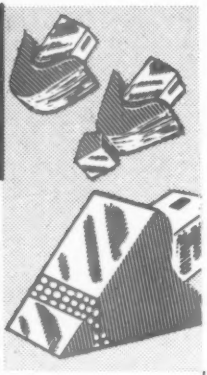
FOR LONGER-LASTING RESULTS
QUICKLY ACHIEVED...
Repoint
WORN SHOVEL and DIPPER TEETH



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U.S. Patents 1,876,738 - 1,947,167 - 2,021,945

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LASTING RESULTS — Manganal Wedge Bars are made of the toughest metal known . . . work-hardens to 550 Brinell . . . minimizes impact and abrasive wear . . . outlast new teeth.

INEXPENSIVE - Longer-lasting results combined with speed of application make Manganal Wedge Bars your best buy.

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Literature on latest methods for speedy and economical repair of worn equipment.

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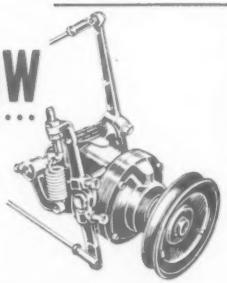

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UNIVERSAL GOVERNOR

fits 9 out of 10 industrial gasoline engines . . . ideal for engine-driven welders.

gives accurate "variable speed" or "constant speed" engine control between 1200 and 2600 RPM.

See your welding supplies dealer or write to:

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World's Most Experienced Governor Manufacturer

For Permanent
Good Results in Welding

METAL BOND
SOLDERING AND WELDING
PRODUCTS

- TINNING COMPOUND—cleans and tins in one operation
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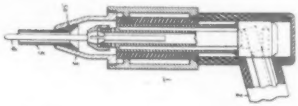
- SEAL-X-O—for filling pin holes in electric welds
- CAST IRON WELDING FLUX NO. 4—also All Steel Wire Brushes and Rod Holders

Try them yourself—find out why they are so widely used. Our handy-size catalog will give you helpful advice—send for it!

METAL BOND MFG. CO.
3201 KOSSUTH AVE.
ST. LOUIS 7, MISSOURI

Inert-Arc Torch

2,612,584. JOHN P. MORRISSEY, East Orange, N. J. Assigned to General Electric Co. Filed Dec. 28, 1949. Granted Sept. 30, 1952.

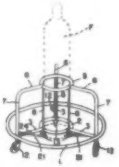


This patent refers to an inert-gas-arc welding torch having a ceramic nozzle adapted to direct a gas flow about the arc and isulate the torch from the work to be welded. An electrode extends through the ceramic nozzle from the torch. A heat resistant tube having an internal diameter larger than that of the electrode is secured to the ceramic nozzle and extends concentric with the electrode. The tube has a number of holes in its wall. Each of the holes extends from the inner to the outer wall of the tube in the direction of the flow of the inert gas. Thereby a flow of inert gas is directed along the electrode towards the work to be welded. Going through the holes it cools the tube and prevents its oxidation.

* * *

Oxygen Tank Cart

2,611,622. IRWIN A. KERNKAMP, Spokane, Wash. Filed July 28, 1950. Granted Sept. 23, 1952.



This patent covers a cart for an oxygen cylinder. The whole cart can be lowered over the tank. The base is formed of inner and outer rings held concentric by metal bars. Another ring is spaced above the inner ring of the base. The latter braces the cylinder against tilting movement. Wheels are mounted on the base. Hooks are pivotally connected with and extend downward from the inner ring. Bills on the hooks swing in and out of supporting engagement with the tank. Links are pivoted to the hooks for vertical tilting movement and extend outward from the hooks. Keepers on the bars allow the links of the hooks to pass upwardly at an incline. Notches in the links fit parts of the keepers and releasably hold the hooks in or out of supporting engagement with th tank.

WELDERS' CLAMPS

HARGRAVE Tested Tools
THE CINCINNATI TOOL COMPANY

Each Tool Is Individually Power - Tested

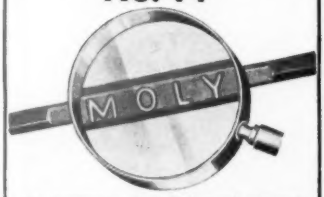
Ask for CATALOG showing the most complete line of CLAMPS. Stock sizes from ¾" to 12' opening ½" to 16" deep.

THE CINCINNATI TOOL CO.
1944 Waverly Ave., Cincinnati 12, Ohio

THERE IS AN INDUSTRIAL DISTRIBUTOR STOCK NEAR YOU

For Closer-Grained Cast Iron Welding

USE Fuse-Well No. 14



An improved rod of high tensile strength that gives you cast iron welds that are easily machined, non-porous, gas tight and leak proof.

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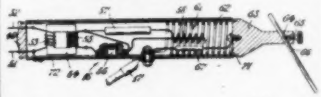
SQUARE AND ROUND CAST IRON WELDING RODS AND ELECTRODES
"Flux-Well" Welding Fluxes
Sold Thru Leading Distributors
THE CHICAGO HARDWARE FOUNDRY CO.
Dependable Since 1872
NORTH CHICAGO, ILLINOIS

Holder and H-F Generator

2,612,582. WILLIAM A. APPLETON, Wembley, England. Assigned to Arc Mfg. Co. Ltd., London. Filed July 7, 1950. Granted Sept. 30, 1952.



For use in electric arc welding, a newly patented electrode holder also serves as a high-frequency generator. It includes conducting end-pieces (jaws) and means for securing a conducting electrode to them in electrical connection. An insulating container is attached to the end-piece. A high voltage, high-frequency generator is placed within the insulating container. The generator comprises an iron-cored coupling transformer with primary and secondary windings. The primary of the coupling transformer is connected to a source of electrical energy at a lower voltage and frequency. The h-f generator also has an air-cored voltage step-up transformer having primary and secondary windings. There is an oscillatory circuit comprising a spark-gap, a condenser and the primary winding of the air-cored transformer. The oscillatory circuit is connected to the secondary winding of the coupling transformer to energize the oscillatory circuit. A tuning condenser is connected across the secondary of the air-cored transformer. Insulated connections provide for the attachment of a welding current cable. The secondary winding is connected between the end-piece and the cable connection. There is a conducting screen around the insulating container.

* * *

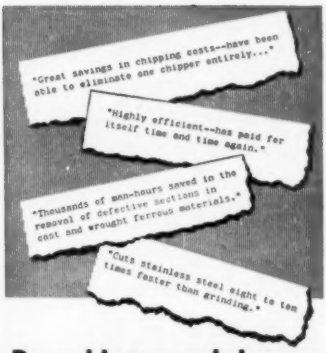
Welding Inside a Vacuum

2,613,305. ROBERT W. CLARK, Lafayette, Calif. Assigned to the United States of America as represented by the United States Atomic Energy Commission. Filed Nov. 26, 1951. Granted Oct. 7, 1952.

A newly patented welding device includes an evacuated chamber. There are means for inserting a pair of metallic parts in it to be welded. A source of high frequency voltage is connected between the parts. Voltage control means are connected to the high voltage source for setting the voltage between the parts to produce multipaction, and means forcing the parts into contact after heating thereof by multipaction therebetween.

* * *

To obtain additional information on listed new products, use the cards on pages 33-34.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"Highly efficient--has paid for itself time and time again."
"Thousands of man-hours saved in the removal of defective sections in cast and wrought ferrous materials."
"Cuts stainless steel eight to ten times faster than grinding."

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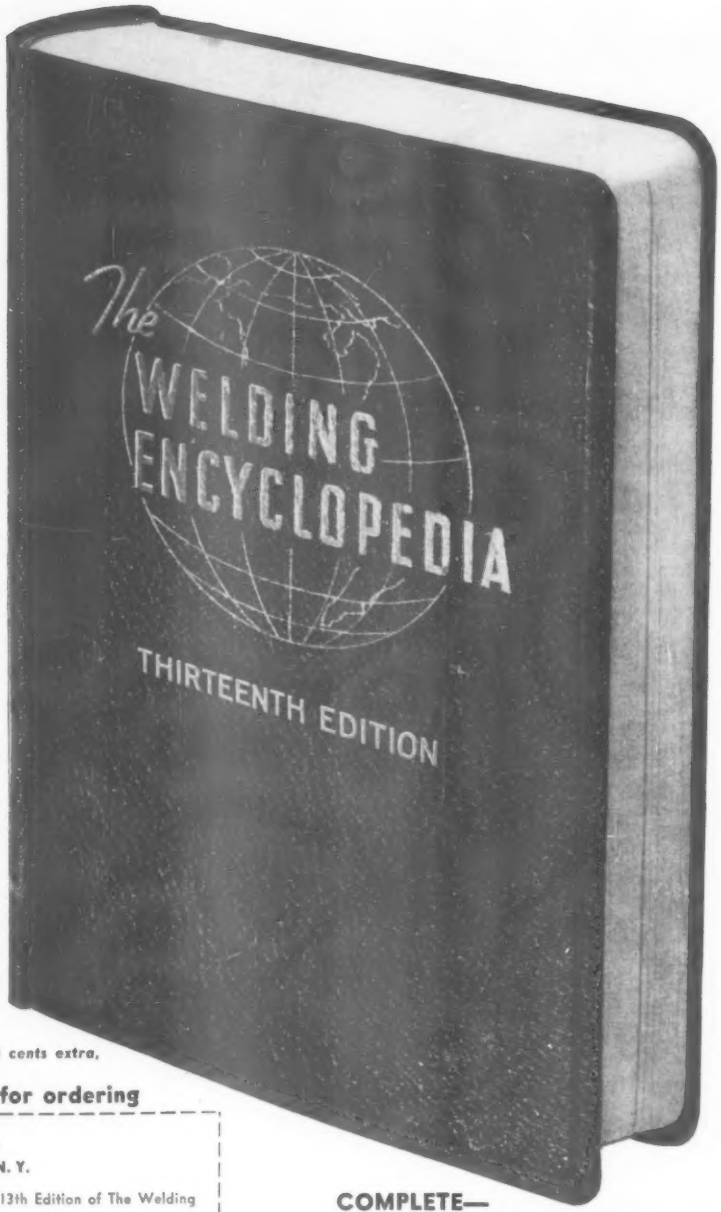

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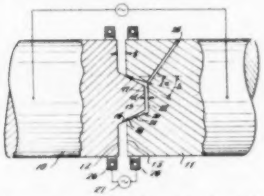
Butt Welding Method

2,604,569. FRANCIS S. DENNEEN, Cleveland. Assigned to The Ohio Crankshaft Co., Cleveland. Filed Feb. 28, 1950. Granted July 22, 1952.

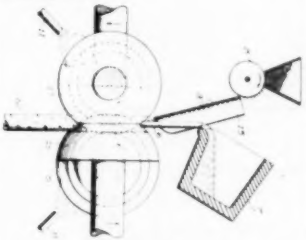


A newly patented method of butt welding a pair of surfaces comprises forming, on one of the surfaces, an outwardly-tapering, frustro-conical projection and on the other of the pair of surfaces, an inwardly-tapering, frusto-conical recess adapted to generally made with said projection. The angle of taper of the projection is slightly greater than the angle of taper of the recess. The maximum diameter of the projection is greater than the maximum diameter of the recess whereby, when the projection is inserted in the recess, the pair of surfaces are at least slightly spaced. The projection is inserted into the recess and simultaneously high-frequency currents are induced to flow in the periphery of the surfaces. Low-frequency electric currents flow between the walls of the recess and the surfaces of the projection.

* * *

Welding Rod or Wire

2,613,304. RENE D. COLINET, Philadelphia, Pa. Assigned to La Soudure Electrique Autogene S. A. Brussels, Belgium. Filed Sept. 6, 1949. Granted Oct. 7, 1952.



This patented welding rod or wire comprises an aggregate of solid fluxing particles dispersed throughout a continuous solid mass of a matrix metal of substantially higher melting point than the fluxing particles. The solid fluxing particles are not fused in contact with the molten matrix metal. The metal has a metallic structure indicative of fast-cooling casting followed by mechanical compression in the plastic stage.

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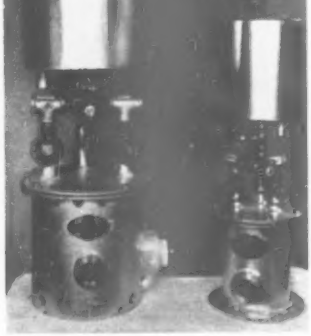
Tiny Soldering Iron

271 JUST ¼-oz. is the weight of the new "Oryx" sub-miniature soldering iron for electronic and instrument work. It utilizes a suspension type element that is said to insure minimum heat loss. No porcelain or ceramic insulators are used, so it will stand up under physical shocks better than larger irons.

The "Oryx" Model 9 comes in three capacities, 6-6½ volts, 12 volts and 24-27½ volts. Power consumption is 8½ watts. Length is 6 in. The bits are of the push-on detachable type and have diameters of either 3/32 or 3/32 in. Average life of bits is 6 to 8 weeks of 8-hr day operation.

ANGLO-NETHERLAND TECHNICAL EXCHANGE LTD., 3 Tower Hill, London, EC 3, England.



Gas Fluxing

272 TWO new model "Gasfluxers," the Model 68 and the Model SFH, give more help to the gas welder than older equipment. The Model 68 was designed for city gas and has ½-in. orifices and a 3-valve by-pass to regulate the amount of flux.

The big Model SFH has a capacity for fluxing 100 to 120 cu ft of fuel gas per hour and a 5-gallon reserve tank. It has a 1,000 watt heater to overcome the refrigerating action of the fuel gas bubbling through the liquid flux.

THE GASFLUX CO., Mansfield, O.

Strip Flash Trimmer

273 A NEW Morton rolling mill flash trimmer is designed for use in a continuous process rolling or pickling line. It is placed next to the flash welder that joins the successive coils of steel. After the welding flash is trimmed, the strip is recoiled into multiple-length coils for various rolling mill economies.

Hydraulic clamping pressure is used for clamping the sheet securely; hydraulic clamps are provided. An upper and lower ram, each containing five adjustable tool holders and cutting tools, operate in hardened ways in the upper and lower housings. The rams move across the sheet and are powered by chain drives connected to a reversible motor.

In operation, the operator stops the welded joint near the center of the machine, then hydraulically traverse the machine to final alignment. A push button controls lowering of the housing and clamping of the sheet. The rams move automatically and simultaneously across the sheet to cut off the flash. At the end of the fixed travel, limit switches unclamp and raise the upper housing, the rams return to the front of the machine and it returns to its central position of traverse. Capacity of the trimmer ranges between 0.056 and 0.250 in.

MORTON MFG. CO., Muskegon Heights, Mich.

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IN 100-LB. LOTS, F.O.B. SCRANTON
SALE OF SURPLUS ELECTRODES
AMPCO-TRODE, 3/16" x 14" No. 10 Aluminum Bronze Coated D.C. Electrodes in Good Condition—25 lb. Cartons—70c lb.
SCRANTON WELDING SUPPLY COMPANY
1301 Wyoming Ave. Scranton, Penna.

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Safe, fast, easily portable, low cost, cutting and burning equipment.
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WELDING SERVICE CO.
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1/8"	Alloyrod Armorarc	19-9	32,245
1/8"	Sureweld Armo	19-9	2,700
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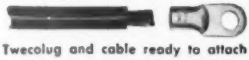
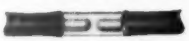
4 SIZES FOR POWER CABLE



Twecolug and cable ready to attach

Bottom view after attaching with "Lug-Set"

TWECO SPLICERS
4 SIZES FOR WELDING CABLE



Bottom view of splicer attached

TWECO RUBBER SLEEVE
A size for each welding splicer

Wrap with friction-tape

TWECO "Lug-Set" Block and Punch No. 12-BP includes a rugged 8-saddle block formed from tough manganese bronze and a sturdy (tool-steel) round nose punch. It is used to attach power and welding cables #14 thru #4/0 to copper soldering lugs in the field or shop. Always a good connection.

It is almost unbelievable that a cold-weld is approached through the compounded impact of this simple process. Actually, this new method of mechanical attachment works perfectly, resulting in maximum conductivity and pull strength without using solder. Lugs are attached in a fraction of the time required by the old uncertain (low conductivity) soft solder process.

TWECO "LUG-SET" BLOCK and PUNCH **$5.00**

WRITE FOR TWECOLOG #8 *Data and prices on the complete TWECO line of electrode holders, ground clamps and cable connections.*

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Tweco

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WELDING PRODUCTS DIVISION
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International Division: P. O. Box 2023 Milwaukee 1, Wisconsin, U. S. A.

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